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WILDLIFE IN NORTH CAROLINA

JANUARY, 1991 $1.50

BIENNIAL REPORT

JULY 1, 1988 - JUNE 30, 1990

North Carolina Wildlife Resources Commission

512 N. Salisbury Street, Raleigh, North Carolina 27604-1188, 919-733-3391
Charles R. Fullwood, Executive Director

His Excellency, The Governor of North Carolina
Members of the General Assembly
Raleigh, North Carolina

Dear Sirs:

I am pleased to present to you the 22nd Biennial Report of the North Carolina Wildlife Resources Commission. This report reflects the Commission's activities and accomplishments for the period beginning July 1, 1988, and ending June 30, 1990.

As chairman of the North Carolina Wildlife Resources Commission, I am happy to report that during the biennium, the Wildlife Endowment Fund principal grew from $14.9 million to nearly $20.4 million through the sales of lifetime licenses, lifetime magazine subscriptions and contributions. The interest from this fund is providing support for many vital programs.

During the biennium, special emphasis has been placed on research and management to aid small game populations. Combined with cooperative efforts to improve small game habitat on both public and private lands, it is hoped that we can duplicate the outstanding success we have had in restoring deer and wild turkey. Our programs also continue to enhance fisheries for popular inland warm-water and cold-water species, and the Wildlife Commission's hunter safety program and the use of blaze orange are making hunting statistically one of the safest of all outdoor recreations.

With the aid of donations generated by the income tax checkoff, the Wildlife Commission has also played a lead role in the survey, protection and management of the state's nongame species, including those that are threatened or endangered. The Wildlife Commission's expanded educational programs under Project WILD and CLASS Project have reached thousands of teachers and students, giving them a much better understanding of wildlife and our natural world.

Our achievements during this biennial period would not have been possible without your support, and the support of the legislature, sportsmen and concerned citizens. We sincerely express our appreciation, and pledge our continued efforts to ensure a sound future for our wildlife resources and the habitat we share with them.

Respectfully yours,

Robert E. Barnhill, Jr.

Robert E. Barnhill Jr., Chairman

January 1991
Volume 55, Number 1

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Department of Environment, Health, and Natural Resources

William W. Cobey, Jr. / Secretary

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WILDLIFE IN NORTH CAROLINA

Wildlife in North Carolina is the official educational publication of the North Carolina Wildlife Resources Commission, and is dedicated to the sound conservation of the State's wildlife and other interrelated natural resources and the environment we share with them.

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Cover *This sleek red fox appears for a brief moment on a snowy day. Photo by Irene Vandermolen*

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MEETING THE CHALLENGES

The N.C. Wildlife Resources Commission is a 13-member body headed by its chairman, Robert E. Barnhill, Jr., of Tarboro. The Commission's executive director, Charles Fullwood, leads an agency made up of 465 employees in fields as diverse as biological research and law enforcement, education and administration.

The past two years have been busy for the Wildlife Commission. Wildlife officials hope that a landmark piece of legislation passed by the 1989 General Assembly will reduce the number of hunting accidents in North Carolina. On July 1, 1991, hunter education becomes mandatory in this state. This new law requires first-time hunting license buyers to certify they have taken a hunter-safety course. License buyers who produce a hunting license issued before July 1, 1991, or who sign an affidavit that they had a license, will not be required to take a course.

MELISSA McGAW

The executive staff *of the N.C. Wildlife Commission. Seated, left to right: Charles R. Fullwood (Executive Director), Richard B. Hamilton (Assistant Director). Standing, left to right: A. Sidney Baynes (Conservation Education), Col. Harold Ragland (Enforcement), Fred A. Harris (Boating and Inland Fisheries), Hal S. Atkinson Jr. (Wildlife Management), Connie R. Spivey (Administrative Services).*

Another important piece of legislation passed in 1989 increased from $250 to $2,000 the minimum fine for illegally killing, selling, transporting or possessing a black bear or bear part.

North Carolina now has a statewide fox-management plan, although many local fox laws still prevail. This legislation provides a hunting season with firearms for gray and red foxes in all areas of the state east of Interstate Highway 77. The fox season opens with the Commission's small-game hunting season and runs to January each year.

A new state law set up a voluntary boat-titling program that has titled 1,500 boats since the program began on January 1, 1990.

The Wildlife Commission continues to increase its efforts against poaching and violations of game laws. During the biennium the agency news program focused on ways to enable the news media and the public to see these efforts firsthand.

One way was to give the media access to major anti-poaching efforts by the Commission's Enforcement Division. As a result of such access, the Commission's efforts to halt bear poaching in the Smoky Mountains in 1988 was widely publicized both nationally and locally.

Another successful enforcement effort was "Operation Stop Fowl Play," a 1989 campaign against waterfowl baiting. The Commission held a press conference at a waterfowl impoundment at B. Everett Jordan Lake in Wake County to announce the campaign, and wildlife officers subsequently distributed 1,500 posters that encouraged the public to report violations.

Notable successes for the Division of Wildlife Management over the past two years have included its wild turkey restoration program and a project to reintroduce river otters to the mountains. By relocating turkeys from one area of the state to other suitable habitats, the Commission has contributed greatly to the comeback of the bird in the state. The turkey population is estimated at 28,000 birds today, while in 1970 the count stood at 2,000. Wildlife biologists are also working to restore otters to rivers they occupied in colonial times. The last known otter populations disappeared from western North Carolina in the 1930s.

The Commission's Nongame and Endangered Species Program reached a milestone during the biennium when peregrine falcons, which had been released in the mountains over the past few years, made several successful attempts at nesting that resulted in 10 peregrine young. Biologists continue to focus on other species of concern, notably freshwater mussels, colonial waterbirds, sea turtles and bald eagles.

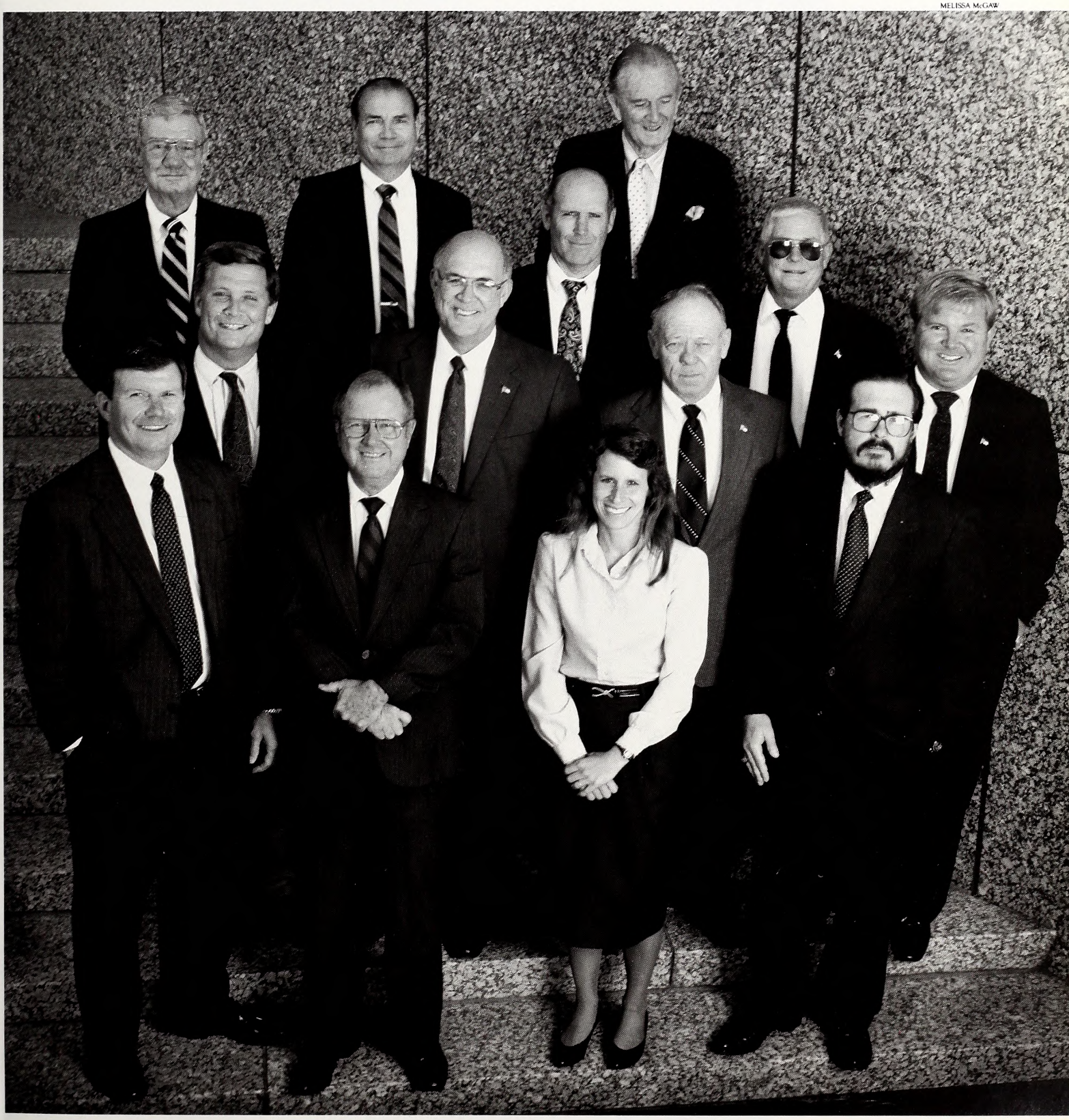
Among the accomplishments of the Division of Boating and Inland Fisheries was a trout management document that will guide the Commission's efforts over the next decade. The division was also part of a multi-agency task force that recommended proper flow levels in the Roanoke River that may restore striped bass populations. It constructed six new boating-access areas and performed major renovations on 11 others. Biologists with the Habitat Conservation section reviewed 1,700 development projects in the two-year period.

The Conservation Education Division continued to put its resources to work in the field of conservation education. New field staff now total nine, who work primarily with schoolteachers through such educational programs as Project WILD and CLASS Project. Personnel have placed a new emphasis on the production of educational publications.

As the Wildlife Resources Commission looks back over the successes of the past biennium, it anticipates continuing to work in the future with sportsmen and conservationists to enhance the welfare of the state's wildlife. ☒

The N.C. Wildlife *Resources Commission. Front row, left to right: Robert E. Barnhill Jr. (Chairman), Eugene Price (Vice-Chairman), Susan L. Allen, R.G. Sowers III. Second row, left to right: Ferrell L. Blount III, Ted B. Lockerman, E. Richard Jarrett, Russell Maughan Hull Jr. Third row, left to right: Stuart R. Paine, Ovide E. de St. Aubin, Richard P. Budd, William H. McCall, Joseph Andrew Neisler Jr.*

MELISSA McGAW



ENFORCEMENT

As the white-tailed deer herds have expanded in North Carolina, firelighting — shining a light in a deer's eyes at night to immobilize the animal for an easy shot — has spread into practically all areas of the state. It has become the state's major wildlife violation and the primary focus of enforcement attention.

Night deer hunters come in all shapes and sizes. They may be high school youths on a lark, hunters who disregard the game laws and only want to kill a deer, or serious poachers who kill deer indiscriminately to sell. Unchecked, their actions could devastate a deer herd.

KEN TAYLOR

***Night-deer hunting** has become the state's major wildlife violation. Cracking down on these potentially dangerous poachers has become the focus of wildlife enforcement throughout the state.*

Statewide last year, wildlife enforcement officers spent 35,923 hours on night deer hunting patrol which resulted in 507 firelighting arrests and 275 violations for shining lights in search of deer past local curfew times.

"Night deer patrols are the most dangerous part of a wildlife officer's job," said Colonel W. H. Ragland, chief of the Division of Enforcement. "Wildlife officers must confront known lawbreakers in the dark who are armed with high-powered rifles, shotguns, and other weapons. A number of these violators have been drinking and neither think nor act rationally. Some are scared and try to flee or fight. And still others have histories of criminal assaults and arrests."

While assaults on wildlife officers occur each year, most situations are defused by trained wildlife officers who forcefully gain control of the situation. Occasionally the worst happens.

Since 1948, a total of six wildlife officers have been killed on the job. Thankfully, there were no major assaults on wildlife enforcement officers during the past biennium.

At the urging of sportsmen, law enforcement officers, and district attorneys, the N.C. Wildlife Resources Commission becomes the 39th state wildlife agency to use deer decoys in combating night deer hunting. Persons shooting at the decoys will be charged with taking big game during closed season and taking big game with the aid of an artificial light. Conviction may result in penalties including an automatic hunting license suspension for two years, a minimum fine of $250, and any other punishment the court may impose.

In addition to enforcement operations aimed specifically at illegal deer hunting, during the past two years the Division of Enforcement placed additional emphasis on special and covert operations to crack down on all types of illegal hunting activities and commercialization of wildlife.

One of these special operations was "Operation Fowl Play," which used officers from across the state to curtail illegal waterfowl hunting activity in coastal regions of the state. The enforcement operation was coupled with an aggressive media campaign which was responsible for focusing public attention and for generating support.

"Operation Smoky" was a joint state and federal covert operation aimed at stopping the illegal killing of black bears and the selling of bear parts in Georgia, North Carolina and Tennessee.

Black bear parts, especially gall bladders and feet, are sold illegally in the Oriental market for medicines. The claws are sold for making jewelry. Hides and heads are sold for trophies.

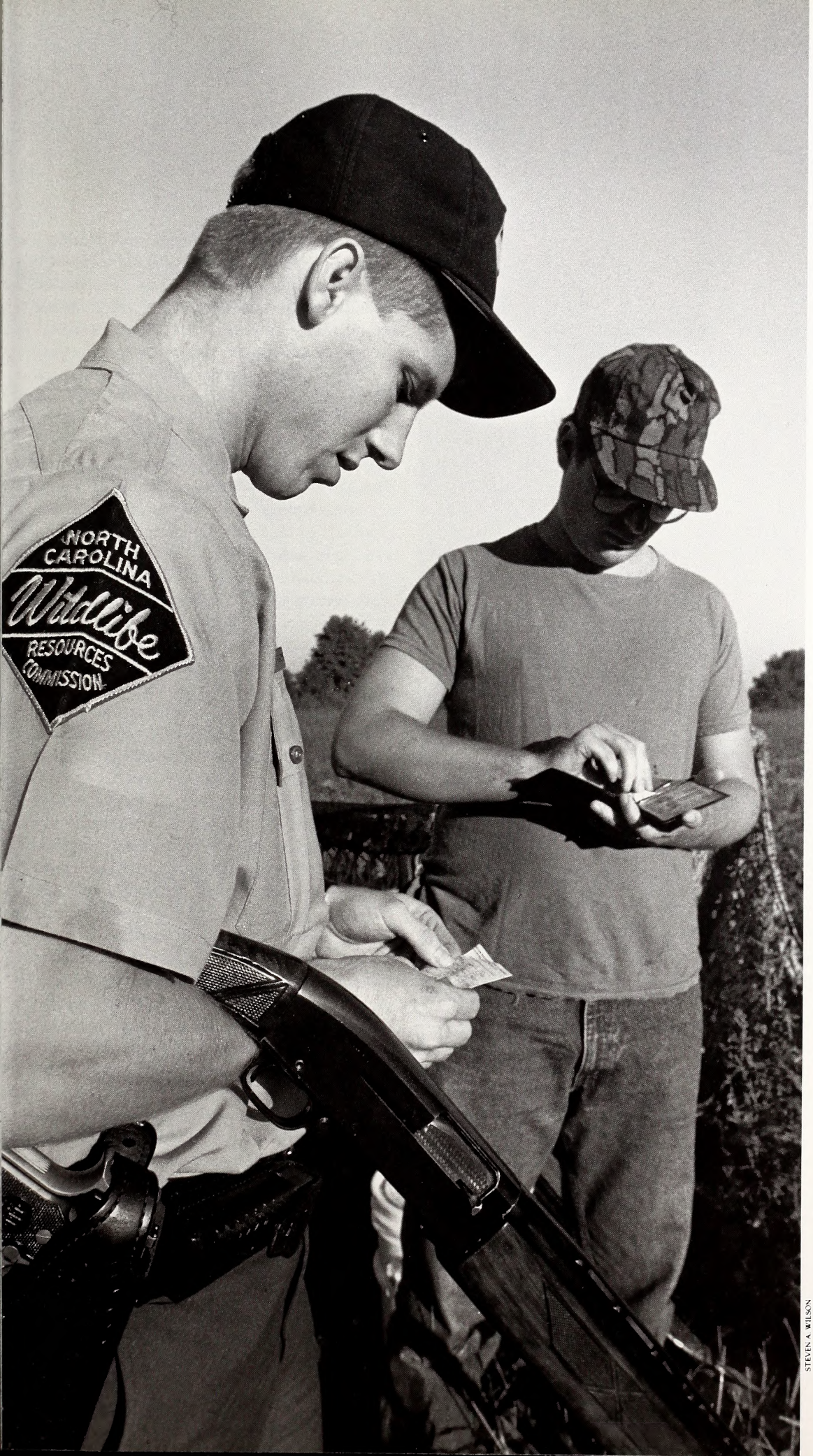
Prompted by this demand, in which one gall bladder could bring between $800 and $1,000, unscrupulous hunters pursued black bears, even in the Great Smoky Mountains National Park. Biologists suspected that the illegal kill was equal to or greater than the legal harvest allowed and that commercialization of black bear parts was largely responsible.

During the three-year undercover operation, wildlife officers and agents of the U.S. Fish and Wildlife Service cracked the illegal ring and purchased 266 bear gall bladders, 385 bear claws, 77 bear feet, four bear heads, nine bear hides, one live bear cub, two mounted ducks, one mounted hawk, a gallon of moonshine and three stolen vehicles.

When concluded in 1989, "Operation Smoky" resulted in more than 130 charges concerning illegal taking and commercialization of black bears and struck a major blow to the illegal wildlife market. All cases now have been adjudicated, with several large fines and active prison terms handed out.

Wildlife officers have continued to pursue vigorously illegal bear hunters in both eastern and western North Carolina, with approximately 25 arrests being made for closed-season bear hunting and hunting over bait during the past year.

Another special operation, "Operation Waterspout," was a multi-district boating-enforcement operation that again used officers from across the state. The purpose of the operation was to place a high profile on enforcing boating laws to help reduce boating accidents in the Piedmont of North Carolina. The operation lasted four days during the



***During the past** two years, wildlife enforcement officers checked nearly a half million licenses of hunters, trappers, fishermen and boaters. Officer Ashley Thompson checks the license of this dove hunter.*

STEVEN A. WILSON

ENFORCEMENT

***Officer Robert Cornell** shows this duck mount to a class at Rollins School in Henderson. Enforcement officers take time to present education programs to schools during the year.*

MELISSA McGAW

Enforcement Synopsis — 1989

Activity	Checked	Arrested	Warned
Hunters	113,644	6,548	562
Trappers	481	165	15
Fishermen	222,181	10,195	2,009
Boaters	124,841	5,793	10,416
Totals:	461,147	22,701	13,002

Enforcement Synopsis — 1990

Activity	Checked	Arrested	Warned
Hunters	110,246	7,171	778
Trappers	293	102	8
Fishermen	234,277	11,022	3,292
Boaters	131,013	6,307	10,955
Totals:	475,829	24,602	15,033

Memorial Day holiday in the spring of 1989 and involved Lake Norman, Lake Wylie, Mountain Island Lake, Lookout Lake and Lake Hickory.

North Carolina has been one of the pioneering states in the use of aircraft to enforce wildlife and boating laws and in search and rescue operations. Working in coordination with officers on the ground, pilots and observers direct wildlife officers to activity and violations observed by the "eyes in the sky." Aircraft are most effective at combating the illegal hunting of deer at night. The blinding Q-beam spotlight the deer firelighter uses to locate deer easily can be seen from above. In a matter of seconds, the illegal hunters can be pinpointed and waiting wildlife officers directed to the location, turning the hunters into the hunted.

During the past two-year period, the Division of Enforcement aircraft flew a total of 3,043 hours, of which 2,710 directly supported enforcement operations. The aircraft assisted in the detection of 1,500 violations that resulted in arrests and in the issuance of 436 warning tickets. There were 133 night deer hunting arrests made with assistance provided by the aircraft. The aircraft averaged assisting in finding one violation for every 1.4 hours of flying time.

In an effort to keep qualified pilots, the Division of Enforcement has instituted a flight training program which has enabled three selected wildlife officers to acquire private, commercial instrument ratings. The cost to the Division of Enforcement was approximately $10,000 per officer, and all three of these officers have been placed in permanent pilot positions. A second training program now has begun to train an additional two pilots.

The addition of computers has been a boon to the Division of Enforcement. Our district supervisors are becoming more professional and more efficient in all areas of their duties including: preparation of written materials and reports, work scheduling, inventory control, budgeting and personnel evaluation and management. Our data banks may be young now, but as they grow supervisors will be able to determine when and where patrol efforts should be concentrated to serve the public better. This is becoming increasingly important in the wake of federal- and state-mandated restrictions on the number of hours enforcement officers may work.

During the past biennium, the Wildlife Commission began sharing its statewide radio system with agents of the State Bureau of Investigation. This agreement has benefited both agencies by providing upgraded communications on a shared-cost basis. As the communications system is expanded, all radio communications will be secure and protected from violators who now use scanners and radios to monitor enforcement frequencies to try to avoid arrest.

Following a year in which there were not enough vacant positions to conduct a recruit training

school, the Division of Enforcement has concluded a 15-week recruit training school which turned out 19 new officers. A second training school has just begun and should provide us with another 15 officers this spring.

During the past year, officers received extensive training in identifying alcohol impairment in boaters. As a result, arrests for operating boats under the influence increased significantly. Several of our officers attended the United States Coast Guard Training School in Yorktown, Virginia, and the Marine Theft Seminar in New Orleans, Louisiana, sponsored by the Southern States Boating Law Administrators Association.

Wildlife Master Officer Mike Criscoe of Henderson and his dog, Link, completed 15 weeks of specialized patrol dog school in December 1989, making Link the first certified patrol dog used in wildlife law enforcement in North Carolina. Only three other states use dogs in wildlife law enforcement. But the idea is catching on.

The two-year-old German shepherd can sniff out a deer hidden in a trunk, locate weapons or game that have been concealed to avoid arrest, and take officers directly to a fisherman on the most remote riverbank. The patrol dog team has been responsible for detecting a number of hunting, trapping and fishing law violations.

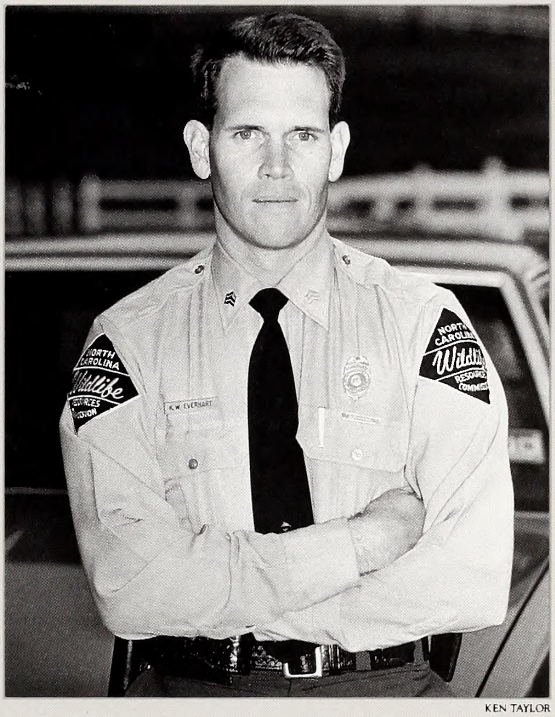
Officer Criscoe and Link occasionally have been called on to assist other law-enforcement departments. On one occasion, the dog helped the Vance County Sheriff's Department find a missing child. While Link was in training, he tracked a stolen vehicle to the suspect's residence, and officers made the arrest.

"Game law violators sometimes may be able to fool an officer, but they can't fool the dog," said Criscoe, a 14-year veteran wildlife officer. "Sportsmen who've seen the dog in action support this effort. It's a better way to conserve the resource."

The Division of Enforcement is responsible for overseeing the hunter-education program in North Carolina. A law making hunter education mandatory becomes effective in North Carolina on July 1, 1991. After that date no one, regardless of age, may purchase a hunting license in North Carolina without first producing either a previously issued hunting license or proof of completion of a hunter competency course from this or another state.

The Division of Enforcement presently is implementing its twofold plan for getting the public and the agency prepared for the July 1, 1991, effective date. We are actively recruiting a cadre of volunteer hunter-education instructors and purchasing additional hunter-education manuals, visuals aids and audiovisual equipment. Posters and reminders are being printed and distributed to sporting goods dealers, license and tagging agents, and hunt clubs.

Besides the time officers spend enforcing wildlife and boating laws and regulations, every wildlife enforcement officer also is expected to make wildlife education and safety presentations to schools, youth and civic groups, and outdoor-oriented groups. We know that the time spent in educating our youth and public today will dictate how well future generations meet the challenges of maintaining our wildlife heritage. ☒



KEN TAYLOR

Ken Everhart
Wildlife Enforcement Officer

During the fall and winter months, I put a lot of emphasis on working night deer hunting. It gives me the greatest pleasure to catch a poacher.

You look at all the other sportsmen that are out in the field, these night deer hunters are robbing them of what they're trying to do legally. Many sportsmen drive a long way, invest money in buying or leasing land, and spend hours scouting. After all this preparation, a night deer hunter may have shot their deer the night before. And since I'm a deer hunter myself, I get a lot of satisfaction when I arrest someone who's night deer hunting.

If we make a lot of arrests, it often serves as a deterrent to others. It allows us to concentrate on another area.

With the new mandatory hunter safety law, we're doing a lot of hunter-safety programs, too. That's something I also enjoy doing because even though our job is really law enforcement, I get a lot of satisfaction out of knowing that I'm helping somebody in a way that might save their life or someone else's.

WILDLIFE MANAGEMENT

Spurred by continued strong demand for wildlife recreational opportunities, the Division of Wildlife Management increased its efforts during the biennium to provide quality programs to fill this need. Wildlife biologists were also active in a wide variety of projects designed to enhance wildlife habitats and populations.

We are proud of the many accomplishments during the past two years and are pleased to submit these highlights of the division's activities.

BIG GAME

Populations of white-tailed deer continued to grow in the Piedmont and Mountain regions of the state, and herds in the Coastal Plain have stabilized with the increased harvest of does. Herd condition and the physical characteristics of individual deer remain good in most areas of the state. Increased emphasis was placed on educating sportsmen about the relationships between deer quality and age, and many regulation changes were adopted to increase the age structure of bucks and the total number of does in the harvest. Deer hunting is now the most popular type of hunting activity in the state.

KEN TAYLOR

***Biologists Mike Seamster** (left) and Larry Warlick band a wild turkey just before its release in Alamance County. So successful is the Commission's wild turkey restoration program that the bird's population now occupies at least 83 of the state's 100 counties.*

Record harvests were obtained during each of the last two hunting seasons.

The state's wild turkey program made significant progress during the biennium. The wild turkey population is now estimated at 28,000 birds, occupying at least 83 of the state's 100 counties.

A total of 388 wild turkeys were relocated to 24 different restoration sites across the state. Division of Wildlife Management employees live-trapped and relocated 226 birds in-state. An additional 162 birds were acquired from other states (70 from South Carolina and 92 from Wisconsin) to supplement these efforts. One of the Wildlife Resources Commission's goals is to restore the wild turkey to all of the suitable habitat remaining in North Carolina.

Two important wild turkey research projects were completed during the biennium. One investigated the effects of flooding on the wild turkey population along the Roanoke River, while the other studied the use of nesting and brood habitat in the western mountains. This work was coordinated with N.C. State University and Clemson University respectively.

Five coastal counties were opened to bear hunting during the biennium. Bertie, Camden, Gates and Pasquotank were opened in 1988 and Craven in 1989. All of these counties had been closed to bear hunting for several years. During the 1988 and 1989 bear seasons a total of 1,119 bears were registered with wildlife cooperator agents. Five hundred and fifty-three bears were registered in 1988, a decrease of 1.5 percent from 1987. Five hundred and sixty-six were registered in 1989, an increase of 2.4 percent over 1988. In addition to the hunter harvest, 109 were killed by vehicles and 18 were killed by farmers in the act of destroying crops.

SMALL GAME

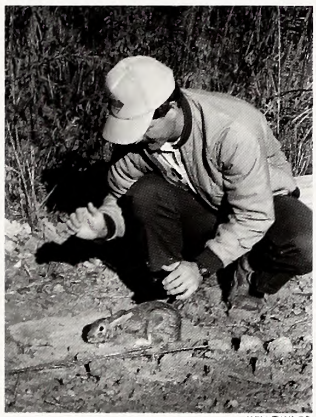
Biologists realize that most small-game hunting opportunities occur on privately owned lands. With this in mind, the Division of Wildlife Management worked during the biennium to develop and promote wildlife management techniques for private landowners that mesh with current farming and forestry practices.

The Commission played a major role in developing and hosting numerous workshops dealing with items of regional interest. A workshop on the biology and management of ruffed grouse in the southern Appalachians was held in Haywood County.

STEVEN A. WILSON

***To increase the** availability of small-game hunting opportunities, the Wildlife Commission continues to promote techniques of wildlife management among private landowners.*

WILDLIFE MANAGEMENT



KEN TAYLOR

***Wib Owen releases** a rabbit at the Penny Bend Rabbit Research Area in Durham County. Continuing research here is evaluating the factors that influence cottontail rabbit populations.*

A small-game habitat improvement program featuring speakers from state and federal agencies addressed farmers and landowners from Edgecombe and surrounding counties. Speakers presented management opportunities and reviewed the various sources of assistance available to farmers.

Monitoring regional populations of small-game species continues to be a high priority. Bobwhite quail and ruffed grouse surveys initiated in the mid-1980s are conducted annually. These surveys have improved our ability to quantify regional changes in the populations of these important gamebirds. An evaluation of a low-cost survey technique for cottontail rabbits is nearing completion.

We continue to gain information from work conducted on the Penny Bend Rabbit Research Area. Biologists are monitoring mammalian predators and analyzing seasonal food habits to determine whether an observed decline in the area's rabbit population can be attributed to predation.

REPORTED BIG-GAME HARVEST

	1987	1988	1989	1990
White-tailed Deer	78,265	83,239	89,690	—
Wild Turkey	680	1,032	1,275	1,534
Black Bear	561	553	566	—
Wild Boar	129	106	147	—

1990 REGIONAL WILD TURKEY RANGE-MAPPING RESULTS

Region	Occupied Range (sq. mi.)	Estimated Population	*Potential Range (sq. mi.)
Coastal	2,628	5,222	1,096
Central	5,916	9,721	821
Western	5,470	13,170	1,563
State	14,014	28,113	3,480

*(Unoccupied turkey range)

MIGRATORY BIRDS

Duck populations in North America have not yet begun to recover from the serious drought in western breeding areas which has hampered reproduction of the birds since the late 1970s. Under the auspices of the NAWMP, Commission waterfowl biologists joined in the cooperative effort to help continental waterfowl populations by identifying important habitats in North Carolina and placing them on a list of Atlantic Flyway areas needing protection or enhancement. A state committee consisting of public and private individuals with interest in wetlands was organized to lead these efforts to restore the continental waterfowl populations.

The Commission began to address the problem of reconciling its waterfowl-management activities with regulations designed to protect wetlands. It is studying the feasibility of a project to construct potholes for waterfowl in brackish marshes at Gull Rock Game Land and Cedar Island National Wildlife Refuge. If the project goes forward it will be a joint venture between the Commission and the U.S. Fish and Wildlife Service.

FURBEARERS

Biologists continue to use a variety of surveys to determine the population status and harvest levels for a number of furbearer species. Efforts continue to develop and evaluate new techniques to obtain accurate information with which to manage our

COMPARISON OF NORTH CAROLINA FUR HARVESTS

Species	1980-81	1981-82	1982-83	1983-84	1984-85	1985-86	1986-87	1987-88	1988-89	1989-90
Beaver	943	1,078	518	535	604	888	1,340	1,379	892	1,105
Bobcat	874	514	625	825	678	748	673	460	174	155
Groundhog	82	6	8	22	6	30	0	0	0	0
Mink	3,817	1,692	1,757	1,367	1,150	928	1,021	861	312	250
Muskrat	83,269	48,468	39,744	37,806	45,117	26,972	25,228	25,073	10,187	5,810
Nutria	1,938	743	874	1,774	1,709	1,194	1,067	2,047	1,131	906
Opossum	16,413	8,090	6,885	2,869	3,377	2,866	3,703	1,635	208	380
Otter	1,679	870	919	869	630	685	785	689	367	408
Raccoon	112,420	88,122	115,032	91,971	81,326	70,966	70,525	63,445	19,633	18,456
Skunk	390	91	65	59	41	50	57	22	1	6
Weasel	89	24	11	22	17	6	3	18	3	0
Fox	4,427	222	115	1,424	1,832	4,192	3,743	2,872	1,105	502
Other	39	0	0	2	0	0	0	0	0	0
Total	226,380	149,920	166,553	139,545	136,487	109,525	108,145	98,501	34,013	27,978

furbearer resource.

As a result of a river otter restoration project approved by the Commission, 16 river otters were trapped by biologists in the Coastal Plain and released in the Catawba River in Burke County. This was the first of a number of river otter releases scheduled for western North Carolina watersheds. The goal of this project is to have viable river otter populations in all North Carolina watersheds with suitable habitat and water quality.

The fur harvest reported by licensed fur dealers during the biennium dropped substantially from previous years. The reported harvest for most species was the lowest recorded in the past 10 years. Low prices for most raw furs is primarily responsible for the decline in harvest.

LAND MANAGEMENT

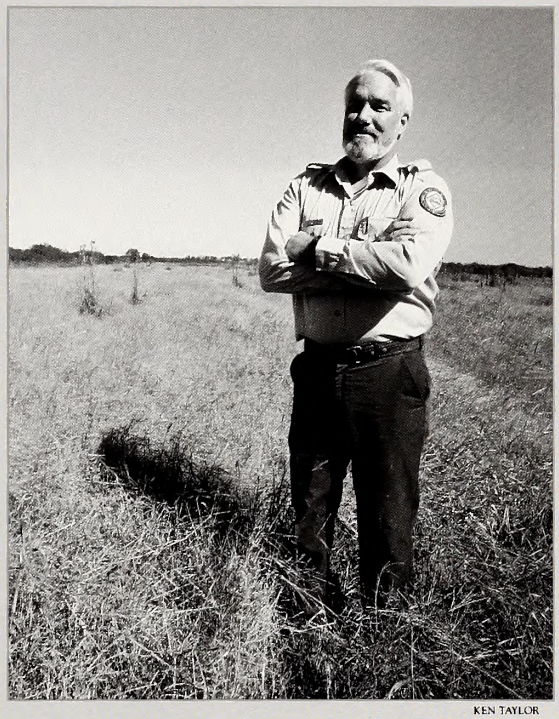
Managing land continues to be a major activity of the division in all physiographic regions of the state. On 1.7 million acres of game lands, 14 management crews across the state carry out work to improve and enhance habitat. On private lands, nine district biologists work with private landowners to improve habitat. Habitat specialists also work on major environmental and habitat-related projects that bear significantly on the future status of wildlife species.

An active prescribed-burning program has continued on game lands in the coastal region. Over the past two years, more than 4,000 acres have been burned to improve habitat conditions for game and endangered species, to increase timber growth and to control wildfires. Several hundred acres have been burned during the summer growing season to improve habitat conditions for red-cockaded woodpeckers.

Permit hunts were planned and conducted for waterfowl on the Pamlico Point, Campbell Creek and Spring Creek impoundments located on the Goose Creek Game Land. Permit hunts were restricted to "high-pressure days" after November 1. Survey results indicate that the quality of the hunt and hunter success have been excellent.

Central region personnel manage 20 game lands that total 260,000 acres of leased and state-owned lands. They posted 872 miles of boundary lines and maintained 400 miles of hunter-access roads and eight hunter campgrounds. To improve habitat, personnel planted 3,921 acres of various varieties of wildlife food and cover plots, top-dressed 538 acres of plots, mowed 729 acres of wildlife openings, and planted 2,669 wildlife food trees and shrubs. On state-owned game lands, foresters and technicians control-burned 16,098 acres to improve wildlife habitat and stimulate desirable plant growth. Seven greentree waterfowl impoundments were operated by managing for optimum shallow flooding of bottomland hardwood timber.

At the Butner and Sandhills nurseries, 23 varieties of seed were grown and processed into 66,512 units of wildlife planting materials, totaling 338,623 pounds. These wildlife planting materials were distributed statewide for the general public and for use on game lands.



KEN TAYLOR

Allen Olmstead
Technical Supervisor

One of my jobs is managing waterfowl impoundments. These are flooded areas that create habitat and food for ducks. In my area we make impoundments in salt marshes and pocosins. We dike off an area, pump the water up and flood it. Ducks use these open areas for resting and even nesting, especially black ducks, and these areas offer them high quality food on their migrations. We also put up wood duck boxes. The impoundments attract a lot of pintails, widgeon, shovelers, gadwalls and blue-winged and green-winged teal.

My biggest challenge is making the impoundments as productive as possible. And that means controlling undesired vegetation that can take over an impoundment. The job is very time-consuming. Some plants grow so fast that they can take over the impoundment if you don't keep them back.

Impoundments are good spots for hunting, although from about September to March the ducks are only hunted maybe 18 or 19 days. Sometimes dikes break and you have to start over again. But most of the time things work out fine and I feel good about what I'm doing for the sportsman and for the ducks themselves.

WILDLIFE MANAGEMENT

Western region biologists maintained close contact with forestry, soils and agricultural extension specialists from other conservation agencies. Cooperative planning greatly expands opportunities to provide quality wildlife management on private lands, and it allows the various conservation agencies to better serve their constituents.

The Wildlife Commission provided technical guidance for improving wildlife habitat, assisted in controlling wildlife problems, and provided managed public hunting opportunities to 1,456 landowners during the biennium. To assist wildlife-habitat improvement efforts on private lands, wildlife planting materials were distributed at no charge to 4,221 landowners in the region.

KIM GARNER

***Biologist Harlan Hall** (right) and wildlife enforcement officer Melvin Hill show a young hunter and his father the jawbone of a deer during a youth deer hunt sponsored by the Wildlife Commission.*

MIDWINTER WATERFOWL COUNTS IN NORTH CAROLINA
1986-1990

Species	1986	1987	1988	1989	1990	Percent Change From 1989	% From 40 Yr. Ave.
Dabbling Ducks	85,600	58,100	91,700	100,000	71,515	-28.5	-28.0
Diving Ducks	109,500	99,000	56,500	55,700	60,287	+8.2	-37.6
Mergansers	30,800	20,000	11,900	6,900	2,444	-64.6	-82.6
Coots	11,200	20,700	26,700	15,200	8,249	-45.7	-83.7
Tundra Swan	52,300	53,500	46,800	53,100	60,243	+13.5	+147.2
Canada Goose	22,800	20,100	21,400	17,100	31,097	+81.9	-63.3
Snow Goose	16,300	12,500	16,800	24,500	38,120	+55.6	+35.5
Brant	500	100	500	1,700	2,420	+400.0	+197.3
Sea Ducks, Misc. and Unidentified	6,500	3,200	1,600	5,100	1,063	-79.2	-84.9
TOTAL	335,500	287,200	273,900	279,300	275,438	-1.4	-32.2

During the reporting period, western region management crews maintained 1,128 miles of game-land boundaries and mowed 4,856 acres of wildlife feeding areas. Crews also planted 34,861 seedlings and released 40 acres of wildlife openings.

Wildlife management crews emphasized small-game management during the biennium. They established annual and perennial food and cover plantings in many wildlife food plots, mowed sod food plots in strips to improve cover, reduced maintenance on some food plots to develop old-field habitat, and let some fields in appropriate areas lie fallow. Wildlife management crews constructed brush-pile shelters for small game in or near food plots whenever materials were available. Work was begun on a project to incorporate forest-management practices and direct habitat improvements to enhance grouse habitat on a 6,000-acre tract of game land.

District biologists and other personnel have reviewed many environmental projects and recommended ways to minimize adverse impacts from development on wildlife and fisheries resources.

Major projects have included reviews of offshore oil and gas exploration, a low-level radioactive waste disposal facility, a hazardous waste incinerator, military activities, and highway documents. The number of permit applications for mining in wetlands seems to have increased during the biennium.

During the biennium two Ducks Unlimited cooperative MARSH projects were completed and dedicated. These include the Hunting Creek MARSH Project, which involved the purchase of 135 acres, including a 45-acre beaver pond, located in western Davie County and the Conine Island MARSH Project, involving the purchase of a 3,750-acre bottomland hardwood wetland tract located in southern Bertie County. In addition, four new projects were approved for funding by the Wildlife Commission and DU. These include the acquisition of 245 acres of bottomland hardwood swamp located along Sweetwater Creek in northern Martin County.

NONGAME AND ENDANGERED WILDLIFE

Biologists released seven peregrine falcons in 1989, bringing the total released to date to 70. With the advent of widespread nesting by peregrines in the mountains, the extensive release of captive-reared peregrine chicks has ended. Peregrines made

MARK WILSON

The white-tailed *deer is still the most popular game species in the state. Record harvests were obtained during each of the last two hunting seasons.*

five nesting attempts in the North Carolina mountains in 1990. Four of these were successful, and 10 peregrine young fledged from these nests. Biologists expect the population to continue growing because all suitable nest sites are not yet occupied. This successful project is an example of excellent cooperation between state and federal government, conservation organizations, and private citizens.

During the biennium, 387 dead or injured sea turtles were reported from coastal waters in North Carolina. These reports were the result of efforts of a large number of cooperators including volunteers and personnel of other agencies. Biological data were compiled and reports were submitted to the National Marine Fisheries Service for inclusion in the international report on sea turtle mortality. In addition, data were collected on 791 sea turtle nests during beach surveys by Commission staff and cooperators.

Emphasis in the bald eagle restoration project switched from releasing young eagles into the wild to locating and monitoring breeding territories. Four new eagle nests were found during the past biennium, bringing the total number of nests in the state to seven. Eleven eagles fledged from these nests during the period. Comprehensive aerial surveys of nesting habitat are being conducted in order to locate additional breeding territories.

During the past decade, dramatic declines have been observed in freshwater mussel populations throughout North America. These declines are evident in North Carolina also. Of 65 freshwater mussel species in North Carolina, half will be listed by the state as endangered, threatened or of special concern. Of those to be state listed, eight will probably be federally listed within the next five years.

The Wildlife Resources Commission is concerned about these declines, because freshwater mussels are extremely good indicators of water quality. Also, they fill extremely important roles in aquatic ecosystems. Their decline may signal the potential for future declines in other aquatic species and water quality in general. Therefore, during the past two years the Nongame Program has devoted time and money to help conserve the remaining freshwater mussel populations in North Carolina. We have surveyed many river systems throughout North Carolina and have provided numerous recommendations to improve management of aquatic habitats. ⊠

KEN TAYLOR

***Working with other** state and federal personnel, nongame biologist John Alderman (right) checks his net after seining for the spotfin chub, a species listed as threatened by the federal government. Spotfin chubs taken from the Little Tennessee River in Swain County are being introduced into Abrams Creek in the Great Smoky Mountains National Park.*

KEN TAYLOR

Wildlife technicians *James Deyton and Mike Carroway release river otters into the Catawba River near Morganton. The Commission's river otter restoration project has resulted in the release of 16 otters in Burke County, the first of a number of otter releases scheduled for western North Carolina watersheds.*

BOATING AND INLAND FISHERIES

Managing the freshwater fisheries, developing and maintaining boating and fishing access areas, and reviewing proposed projects that threaten aquatic habitats are the primary responsibilities of the Division of Boating and Inland Fisheries. In addition, division personnel maintain waterway markers, operate fish hatcheries, develop and evaluate fishing regulations, improve fish habitat, advise private pond owners and present public programs.

The following report describes the programs and accomplishments of the division during the past biennium.

BOATING FACILITIES PROGRAM

During the 1988-90 biennium, six new boating-access areas were constructed, bringing the total number of areas operated by the N.C. Wildlife Resources Commission to 160. The new areas are located on the Trent River in Jones County, the Chowan River in Gates County and the Little River in Johnston County and on Lake Wylie in Gaston County and Lookout Shoals Reservoir in Iredell County.

Division personnel renovated 11 areas, replacing ramps and docks and expanding or regrading parking areas. These 11 areas were Snow's Cut in New Hanover County, Bridgeton in Craven County, Oak Island in Brunswick County, Pee Dee in Anson County, High Rock in Davidson County, Gatesville in Gates County, Avents Ferry in Chatham County, Stoney Mountain in Stanly County, North Fork in McDowell County, Conley Creek in Caldwell County and Bear Lake in Jackson County.

The division is also responsible for the placement and maintenance of 784 navigational buoys on inland waters. These buoys identify channels, hazards, congested areas and no-wake zones.

HABITAT CONSERVATION PROGRAM

Fisheries and wildlife resources in North Carolina are dependent upon the quality and abundance of aquatic and terrestrial habitats. It is the Wildlife Commission's responsibility, mandated by various state and federal laws, to protect and enhance these habitats for the benefit of wildlife and the public. Wetland areas, which include wooded swamps, marshes, bogs, pocosins, streams and lakes, provide especially important habitat to a wide variety of wildlife species, including threatened and endangered plants and animals. In addition to being important to wildlife, wetlands recharge groundwater, filter sediment and other pollutants from rivers, and store floodwaters. As the state's population grows, fewer areas remain for wildlife. According to a recent U.S. Fish and Wildlife Service report, North Carolina has lost 5.4 million acres, or about 50 percent, of its historic wetlands to development and ranks ninth nationally in wetlands acreage destroyed. It is especially critical, therefore, to protect the state's remaining wetlands.

The Wildlife Resources Commission's policy regarding wetlands is detailed in a 1988 agency publication titled "Policies and Guidelines for Conservation of Wetlands and Aquatic Habitats." Commission fish and wildlife biologists must inspect and review the environmental impacts of various construction projects, such as marinas, highways, mines, and hydroelectric development. Biologists recommend ways to minimize adverse impacts of the projects on habitat and to assure that unavoidable losses receive adequate mitigation. Commission biologists reviewed approximately 1,700 projects during the biennium.

RESEARCH AND SURVEY PROGRAM

One of the most challenging problems facing division personnel during the biennium has been management of the Albemarle Sound-Roanoke River striped bass population. Since the 1970s, these fish have been in peril due to human population growth, overfishing and improper management of river flows during spawning seasons. During the biennium, a multi-agency task force of resource conservation agencies formed the Roanoke River Flow Committee and recommended ways to manage proper flow levels in the Roanoke River. Through a joint agreement among the Wildlife Commission, Virginia Electric and Power Company and the U.S. Army Corps of Engineers, the recommended flow levels were implemented in 1988. Striped bass spawned successfully that year for the first time since 1976. The striped bass harvest by hook-and-line fishermen in the Roanoke River has been closely monitored each year by division personnel, and limited yearly harvest quotas are now in place as set forth in federal striped bass management directives.

In Currituck Sound, a drought lasting nearly

STEVEN A. WILSON

It's that magic moment *for fishermen when the sun rises and the fish begin biting. These two anglers try their luck for largemouth bass at Lake Mattamuskeet. Catching fish isn't simply a matter of luck, however. The good fishing many of us enjoy throughout North Carolina is closely tied to sound management and research.*

four years caused a dramatic increase in saltwater levels. As a result, this nationally known largemouth bass fishery was nearly eliminated. With abundant rainfall, salinity levels in the sound returned to normal in 1989. Division biologists began an intensive survey of the Currituck Sound fish population to monitor recovery of the bass population. To aid in restoration, the Commission stocked nearly 60,000 largemouth bass fingerlings in Currituck Sound and enacted restrictive regulations to prevent the harvest of small bass.

Research and surveys conducted in the Piedmont were designed primarily to improve largemouth bass and crappie management in the region's numerous reservoirs. Biologists are enthusiastic about changes in bass populations where fishing is controlled by special regulations. The 16-inch minimum-size limit at Jordan Lake was put in place because of poor bass reproduction. Spring shoreline electrofishing has demonstrated that bass reproduction has since returned to normal. The 1990 bass year class is very strong, according to seine samples collected at the lake by biologists with the Wildlife Commission and N.C. State University who are working on a Commission-funded study.

The 12- to 16-inch slot limit at Falls of the Neuse and Tuckertown reservoirs was expected to increase the average size of bass in these waters. Of the bass larger than 8 inches collected by biologists at Tuckertown in 1990, 75 percent were longer than 12 inches and 43 percent were about 14 inches long. At Falls of the Neuse, 86 percent of the bass collected were longer than 12 inches and 56 percent were longer than 14 inches. The regulation appears to be allowing more fish to get a little larger.

One important component of the slot-limit study is the angler-diary program. It is important to determine how regulation changes affect the angler as well as the fish. The Wildlife Commission has a small group of volunteer anglers fishing each of the slot-limit lakes and keeping records of their bass-fishing trips, including the size and number of bass caught and whether the fish were released or kept. Biologists hope to use this information to see if

BOATING AND INLAND FISHERIES

ANGIE HILL

***Fisheries technician Cindy Paulk** wields the net during an electro-shock survey of the wild brook trout population in the upper Tuckasegee at Panthertown. The trout are only temporarily stunned, and can be released once they are checked. Electro-shock equipment is frequently used by fisheries biologists in surveys of other species such as striped bass and largemouth bass.*

changes in the bass populations have changed the quality of fishing.

Wildlife Commission biologists recently completed a four-year study that looked for evidence that crappie might be overfished in this state. Biologists found that some crappie populations needed to be fished much harder while others might benefit from restrictive regulations. The results imply that statewide crappie size and creel regulations would not be appropriate at this time because they would harm crappie populations that are being underharvested. However, the pounds of crappie going home in anglers' coolers at some lakes could probably be increased by using restrictive regulations.

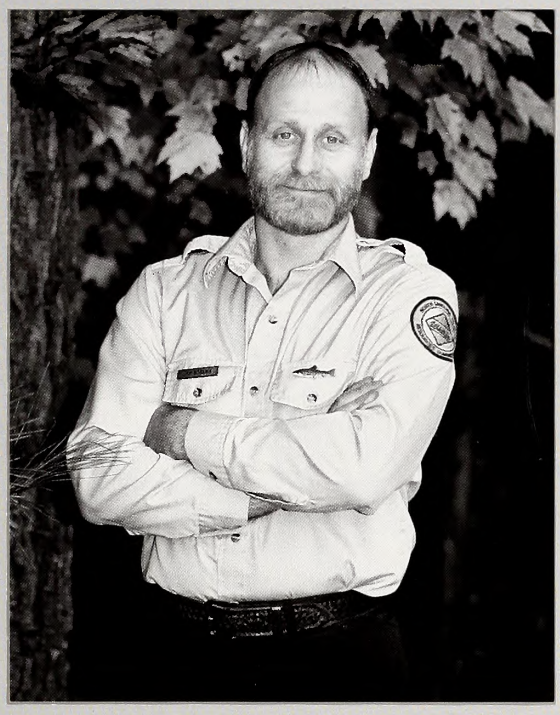
While largemouth bass and crappie attracted the most research effort in the biennium, the Wildlife Commission also was involved in studies of flathead catfish and striped bass. An angler diary is being used to look for changes in the size, number and age of flatheads being caught in the Yadkin River system. Another study is under way to compare the contribution of the lake fishery and upstream tailrace fishery to the harvest of striped bass in a Yadkin reservoir.

***This angler is** sampling the good fishing at Lake Oka T. Hester in Greensboro while fisheries technicians Dean Barbee (left) and Keith Henderson fill a feeder. The intense management of this lake is part of the Commission's very popular urban fishing program.*

The Mountain region contains some of the most diverse fishing opportunities in the state. The region contains all of the state's mountain trout streams, most of its coolwater fish populations (which include muskie, smallmouth bass and walleye), and warmwater fish species such as largemouth bass. The division staff in this region is constantly surveying these resources and conducting research projects to improve the management of these fisheries for the state's anglers.

A formal trout management document was developed, adopted by the Commission and implemented during the biennium. The document sets the course of trout management over the next decade. The goal of the plan is to protect the wild trout resources of the state while providing diverse fishing opportunities within the resources' capability. In addition, the catchable trout program is better defined and additional fishing opportunities using stocked fish are being identified.

One of the best wild brook trout populations in North Carolina came under public management when the U.S. Forest Service purchased the Panthertown Valley, known as the "Yosemite of the East," from Duke Power Company. To protect this brook trout population from overharvest, a new regulation was implemented. The regulation allows the use of single-hook artificial lures but does not allow any harvest. The catch-and-release regulation is designed to allow anglers to have the chance of catching one of the large (up to 15-inch) brook trout which exist in the streams of the area.


KEN TAYLOR

Jim Borawa
Fisheries Biologist

The fisheries program I've been most involved with is the development and adoption of a management plan for wild trout. Fishing pressure has increased to the point that it's time to protect our wild trout resources. If we do this, we'll have fishing opportunities for wild trout that more closely resemble opportunities on streams less affected by fishing pressure.

What I'm excited and challenged by is the chance to base our management on the resource capabilities. We've not had a specific program to address trout management in that way before.

Also, as a biologist and a scientist I'm excited by the possibility of looking at individual streams in more detail and monitoring them more closely. We can develop more scientific evidence of what our wild trout populations are doing on a year-to-year basis and over a longer term.

On the other hand, we don't want to diminish the importance of our hatchery-supported, or "put-and-take," program. Because that's the program that provides fishing experiences where little or none would exist.

MUSKELLUNGE

The volunteer angler diary program was concluded during 1989. This study was designed to determine how North Carolina muskie catch rates compare with those in other states and whether stocked muskellunge fingerlings are contributing significantly to the fishery. While anglers reported a fairly high catch rate, most of the muskie captured were of sublegal length (less than 30 inches). In addition, many of the smaller muskie being caught had a fin clip which identified them as stocked fish. This data will be combined with habitat data and age and growth information and a management plan developed in the near future.

SPOTTED BASS

Many bass fishermen have expressed desire for the division to stock spotted bass in North Carolina reservoirs. The division has generally not pursued this because spotted bass usually establish populations of small fish that compete with largemouth and smallmouth bass. However, W. Kerr Scott Reservoir contains few smallmouth bass and only a fair largemouth bass population. In an effort to enhance the bass population there, the division stocked spotted bass into the lake during the 1970s, and in 1987 it conducted shoreline electrofishing to determine the status of the bass populations there.

The results showed that spotted bass have become the most abundant bass in the lake, while largemouth and smallmouth bass populations have remained unchanged. Spotted bass were found to grow to an average of 10-12 inches during their

average four-year life span. This meant that few of the spotted bass lived long enough to reach the 14-inch size limit and none reached 18-inch trophy size. Because of these conditions, the size limit on spotted bass in W. Kerr Scott Reservoir was eliminated effective July 1990.

Spring electrofishing sampling on selected Mountain region lakes indicates that largemouth populations are holding up well under heavy fishing pressure. Continued annual sampling will help biologists identify lakes where fishing pressure is having severe impacts on the bass population.

In addition, a reciprocal license agreement between Virginia and North Carolina for a portion of the New River was adopted early in 1990. Anglers floating the New River in Grayson County, Virginia, and Allegheny County, North Carolina, can now fish under North Carolina or Virginia licenses.

FISH PRODUCTION PROGRAM

Warmwater Fishes Stocked

Species	1989	1990	Total
Striped bass	888,603	605,426	1,494,029
Bodie bass	75,452	64,401	139,853
Largemouth bass	122,000	14,670	136,670
Bluegill	107,125	163,568	270,693
Redear sunfish	88,000	96,000	184,000
Redbreast sunfish	26,000	0	26,000
Sunfish hybrid	300	9,469	9,769
Channel catfish	47,350	33,500	80,850
Threadfin shad	8,108	6,966	15,074

Coolwater Fishes Stocked

Species	1989	1990	Total
Walleye	150,158	313,857	464,015
Muskellunge	1,528	*	*
Smallmouth bass	4,147	12,831	16,978*

*1990 muskie not yet harvested

Catchable Trout Stocked

Species	1989	1990	Total
Brook	92,196	149,431	241,627
Brown	211,864	130,203	342,067
Rainbow	291,817	312,198	604,015

Fingerling Trout Stocked

Species	1989	1990	Total
Brook	25,012	0	25,012
Brown	191,150	124,937	316,087
Rainbow	105,632	178,386	284,018

TECHNICAL SERVICES PROGRAM

Coastal Region

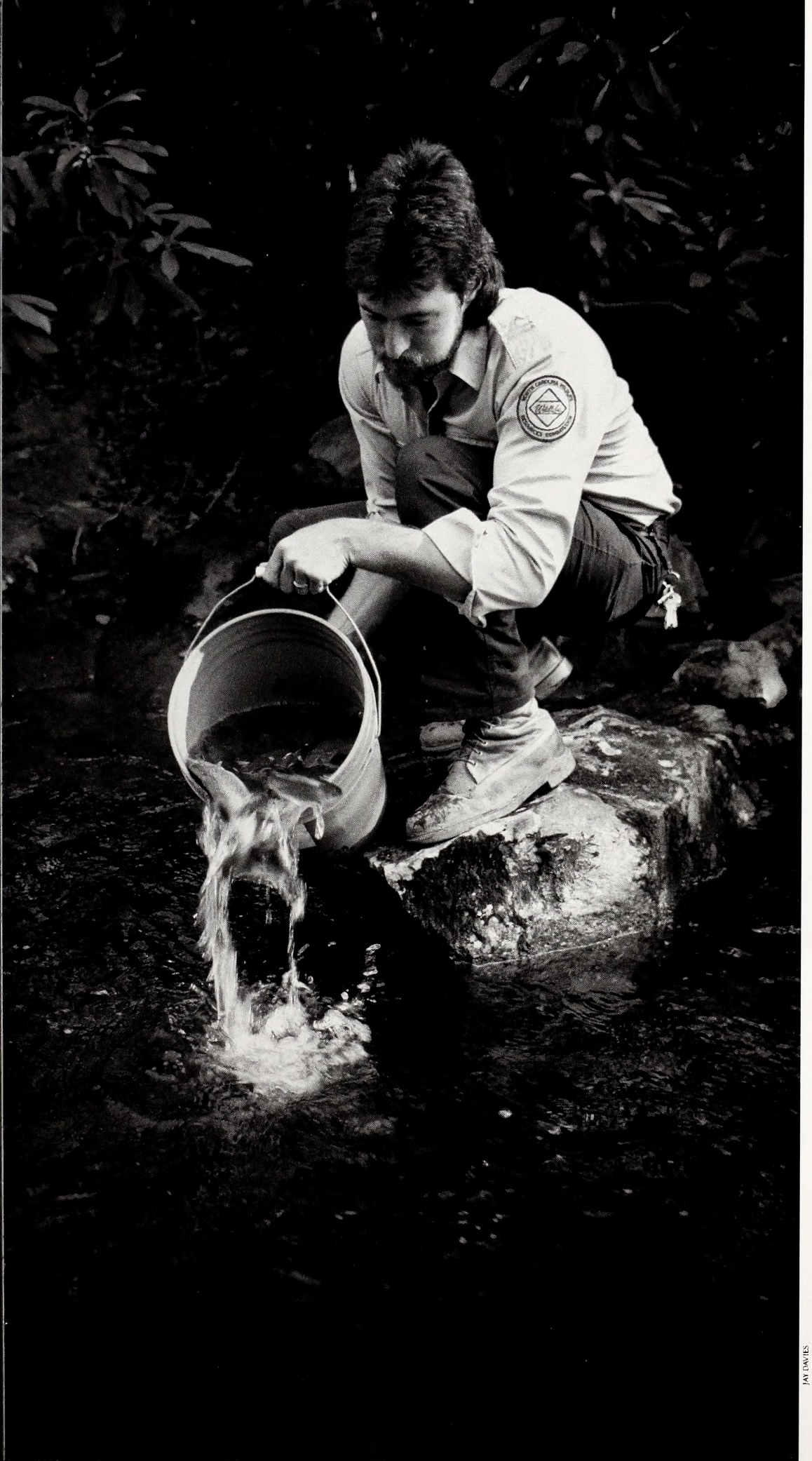
North Carolina "farm" ponds receive a great deal of fishing pressure and represent a significant portion of the state's fisheries resources. There are approximately 100,000 farm ponds in North Carolina, and providing fisheries management advice to farm pond owners constitutes a major portion of the division's Technical Services Program. Some of the best fishing in North Carolina is found in farm ponds, and the Wildlife Commission furnishes information on managing these ponds free of charge. During the past biennium, biologists consulted with over 1,200 pond owners across the state.

Also during the past biennium, Commission biologists, in conjunction with personnel from the N.C. Agricultural Extension Service and N.C. State University, prepared a booklet on managing farm ponds. The booklet deals with everything from siting and constructing ponds to improving water quality and solving problems. It is available from the Commission's Raleigh Office at (919) 733-3633, the Agricultural Extension Office at N.C. State University (as well county Extension offices) and individual district biologists with the Division of Boating and Inland Fisheries.

FISHERIES MANAGEMENT PROGRAM

Coastal Region

Two fishing platforms were constructed on the banks of the Northeast Cape Fear River near the Holly Shelter Boating Access Area and one at the Hope Mills City Lake in Hope Mills. A total of 2.55 miles of shoreline was cleared of brush on seven lakes or rivers to enhance bank-fishing opportunities. Boat corridors were cut on nine blackwater rivers or creeks where public boat launching facilities are located. Approximately 157 river miles were cleared enough to allow a small boat to pass. A total of 204 fish attractors, constructed of discarded Christmas trees, were placed into nine lakes. Sutton Lake in New Hanover County received 80 attractors and Greenville City Lake in Pitt County received 30. The following waters received 16 or fewer: Crawford Lake (Scotland Co.), Richmond Mill Pond (Scotland Co.), Hope Mills City Lake (Cumberland Co.), Pembroke Creek (Chowan Co.), Bennett's Creek (Hertford Co.), Pasquotank River (Pasquotank



These trout from *the Pisgah Forest State Fish Hatchery are being stocked by fisheries technician Dan Fletcher as part of a program to provide trout fishing in lakes and streams that may not be capable of producing wild trout. During the biennium, the Commission adopted a trout management plan that will seek to protect and enhance wild, stream-bred trout and the streams that are capable of producing them.*

JAY DAVIES

BOATING AND INLAND FISHERIES

KEN TAYLOR

***Fisheries biologist** Shari Bryant (left) records information about crappies caught in nets on Jordan Lake as part of a major study of growth rates and numbers of these popular sportfish in impoundments. This study, underway during the biennium, is revealing useful information that will be applied in management techniques in the years to come.*

Co.), and Boiling Springs Lake (Brunswick Co.).

Piedmont Region

Public fishing areas were constructed on NC Highway 98 on Falls-of-the-Neuse and at Bell's Chapel and Weaver Creek on B. E. Jordan Lake. Each public fishing area includes a graveled parking lot, access trails to the water and a shoreline clear of brush.

Natural brush, Christmas trees or artificial PVC "brush" were emplaced to create new fish attractors or added to existing attractor sites at Cane Creek Park Lake (Union Co.), Reidsville Lake (Rockingham Co.), Badin Lake (Stanly Co.), Falls-of-the-Neuse Lake (Wake Co.), Lake Tillery (Montgomery/Stanly counties), Lake Ramseur (Randolph Co.), Lake Norman (Mecklenburg Co.), Jordan Lake (Chatham Co.), and Oak Hollow Lake (Guilford Co.). Shoreline hardwood trees were also cut, hinged and cabled at Badin and Ramseur lakes. Fish attractor buoys were installed or maintained at all sites.

An urban fishing program was initiated with a pilot study at Lake Oka T. Hester in Guilford County. This lake is owned by the Greensboro Parks and Recreation Department and is the site of a city park. The objective of this pilot study is to determine the economics and feasibility of incorporating urban fishing programs into the overall recreational programs of local governments. To increase angling opportunities, fishing piers have been constructed, fish feeders have been installed, and fish attractors have been emplaced. Other management has included the stocking of 1,500 catchable-size channel catfish and feeding with 300 pounds of sinking catfish feed per week during the spring, summer and fall. Detailed records are being maintained of the costs of all management activities. A creel census is being conducted during the

peak fishing months of May through October to estimate fishing pressure and harvest. These data will be used to evaluate the costs and benefits of the program and will provide valuable information to other local governments who are interested in implementing similar programs. An urban fishing program is being implemented at Lake Luke Marion in Moore County, and considerable interest in the program has been expressed by other local government agencies.

Mountain Region

In cooperation with Trout Unlimited and U.S. Forest Service personnel, a fishing pier was constructed on Lake Powhatan in the U.S. Forest Service's Bent Creek Recreation Area near Asheville. The pier was constructed to accommodate physically handicapped individuals.

A public fishing area was cleared of brush on Catawba River below Lake James (Bridgewater Powerhouse). Steps were built down the steep bank to provide safer access to the river. Plans are complete and materials have been purchased to construct a fishing platform to accommodate the physically challenged.

Seventy-three stream-improvement structures were constructed in the following streams: Park Creek (10), Bryson Branch (10), Crabtree Creek (11), Roaring Creek (12), South Mills River (13), Looking Glass Creek (10), Big Creek (3), and Right Prong of Pigeon River (4). A total of 93 fish attractors were constructed in regional reservoirs. Materials used in attractor construction included Christmas trees and shipping pallets. Additionally, 30 trees were cut and cabled.

STRIPED BASS AND HYBRID PRODUCTION

Striped bass and Bodie bass (striped bass x white bass hybrids) were stocked in many reservoirs across the state to maintain sportfishing opportunities. Broodstock for striped bass and Bodie bass fry production were obtained from the Dan and Roanoke rivers and Lake Gaston and transported to the Commission's spawning facility at Weldon.

A total of 888,000 one-inch striped bass fingerlings were stocked in 1989 and 605,000 were stocked in 1990. The 13 reservoirs receiving striped bass fingerlings include: Rhodhiss, Hickory, Lookout Shoals, Norman, Mountain Island, High Rock, Tuckertown, Badin, Tillery, Blewett Falls, Gaston, Roanoke Rapids and Falls. Approximately 75,000 Bodie bass fingerlings were stocked into North Carolina waters in 1989 and 64,000 were stocked in 1990. Waters receiving Bodie bass include: Jordan, Thom-a-Lex, Oak Hollow, Moss, Salem, Townsend and W. Kerr Scott.

Approximately 15,000 threadfin shad were stocked into some of the state's reservoirs to supplement game fish food supplies. Adult threadfin shad were collected from the tailrace of Mountain Island Reservoir and transported to the selected reservoirs.

In the mountains, the emphasis in fish production is on trout. The Wildlife Resources Commission operates four fish hatcheries for trout production and distribution. During the biennium, an average of 593,855 catchable-size trout were stocked each year in approximately 1,000 miles of streams in western North Carolina. Our hatchery trucks logged over 110,000 miles during the biennium providing additional trout-fishing opportunities to areas which normally support only limited trout populations. In addition, 10,000 catchable trout were provided for the Commission's CATCH programs and National Fishing Day events.

Fingerling trout stockings were conducted to supplement wild trout populations in certain high-quality trout waters where natural reproduction is limited. Over 625,000 fingerling trout were stocked during the biennium, frequently in remote areas using backpack cans with assistance from local sportsmen groups. Improvements were made in the quality of fish produced at division trout hatcheries. The average size of catchable trout stocked increased to 9.55 inches during 1990 and significant improvements were attained in rates of trout growth and feed conversions. A program to monitor fish health was initiated to reduce the impact of fish diseases in our hatcheries and enhance the survival of trout after stocking.

The production of coolwater fish species continued to provide additional angling opportunities across the state. Late-season stocking of muskellunge fingerlings during the biennium enhanced natural muskie populations in the French Broad, New and Nolichucky river systems in western North Carolina. Production of walleye fingerlings was continued, and additional walleye egg sources were secured from Minnesota and Kentucky. Smallmouth bass fingerlings were stocked to offset poor reproduction of smallmouth in the Catawba River. ⊠

CONSERVATION EDUCATION

With more and more people sharing living space at the same time that natural areas are dwindling rapidly, the stewardship and care of North Carolina's many habitats and species of wildlife are almost entirely dependent upon concerned citizens. Simply caring, however, is not enough to protect and enhance these resources. More and more, the welfare of wildlife depends upon informed decisions, and that means that education of present and future generations is the key.

To educate and inform citizens, the Division of Conservation Education works with schoolteachers and youth groups through a series of conservation education workshops. To augment and support these programs, the division prepares television and radio material and publishes a monthly magazine and numerous handbooks and brochures, as well as displays and exhibits. The Wildlife Commission's special waterfowl and other stamp programs are also coordinated through the division. Three sections within the division — Field, Publications and Audiovisual — work in these areas.

KIM GARNER

During the biennium, *more than 115 Catch (Carolina Anglers Teach Children How) clinics were conducted, reaching more than 7,500 kids. Many youngsters, such as this happy angler (above), are introduced to a lifetime sport in a manner that teaches biology, safety and outdoor ethics.*

FIELD SECTION

One of the most critical functions of the division is providing accurate wildlife and environmental educational services to students and teachers, and this service is handled by staff members scattered across the state who work primarily with schools, but who also provide information about agency programs and services to local news media.

During the biennium, the field staff conducted nearly 400 programs for students or other groups, appearing before some 25,000 individuals. In addition, more than 200 Project WILD and CLASS Project teacher workshops were held for 4,319 adult educators. By the end of the biennium, more than 8,000 educators had been reached through more than 400 workshops, and assuming conservatively that each adult might reach 30 students in a classroom or youth program, some 240,000 people were exposed to environmental education. These workshops are designed to teach educators not only a valid understanding of natural ecology and wildlife but effective methods to impart this knowledge. The Publications Section cooperated in the preparation of a publication that correlates Project WILD activities with objectives for kindergarten through 12th grade in science and social studies. Now, North Carolina teachers can use Project WILD activities to reach state-defined objectives. Project WILD was also correlated to the 4-H curriculum, and a review of aquatic education software was prepared.

In response to the number of requests for additional teacher programs and more information specific to North Carolina, a series of advanced Project WILD workshops was begun during the biennium. The first focused on predators and drew over 100 participants.

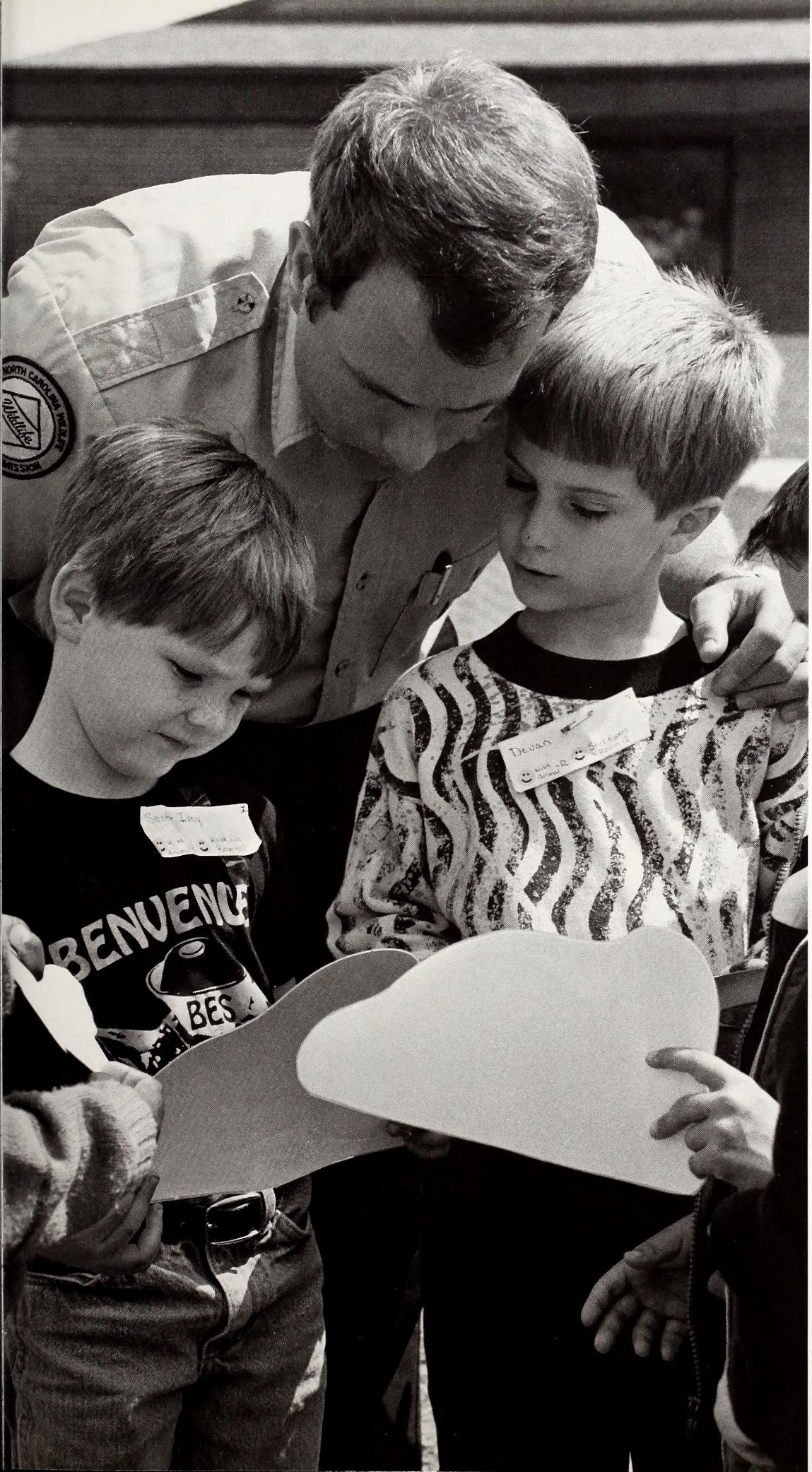
The biennium saw the beginning of the agency's involvement in The Big Sweep, a statewide litter cleanup program. In 1988, 17 inland sites were coordinated by the section, and 4,000 people statewide picked up 80 tons of trash despite interference from Hurricane Hugo. In 1989, more than 6,000 people picked up 150 tons of trash. The Big Sweep has won state and national awards three years in a row. In 1989, a division representative went to Washington, D.C., to receive one of the awards.

Two youth programs grew in popularity during the biennium. More than 115 CATCH (Carolina Anglers Teach Children How) clinics were held across the state, reaching more than 7,500 kids. Many of the kids who attend these clinics have never fished before and are introduced to a lifelong sport in a manner that teaches a short course in biology, safety and ethics. Youth hunts similar to the fishing clinics are also held during the fall and winter months.

PUBLICATIONS SECTION

The Publications Section designs and edits virtually all of the published material used by the Wildlife Commission, and the flagship is the full-color, monthly magazine *Wildlife in North Carolina*. During the biennium, *Wildlife in North Carolina* won a second and fourth place in international competition among wildlife publications sponsored by the Association for Conservation Information (ACI). Greater emphasis has been placed on environmental and educational subjects in the magazine during the biennium to coordinate with the overall goals of the division; however, roughly half of the magazine still relates directly to hunting and fishing.

Other publications prepared during the biennium included more than 300 separate projects begun or completed ranging in diversity from the



MELISSA McCAW

Education specialist *Tim Lemon lends a hand to students involved in a Project WILD activity. With our wildlife resources coming under increasing pressure from a burgeoning human population, the future of the environment depends on educated citizens making responsible decisions. The Division of Conservation Education has been concentrating on informing the new generation — our children — through conservation education workshops, programs and publications.*

CONSERVATION EDUCATION

MELISSA McGAW

***The art staff** of the Division of Conservation Education's publication section is responsible for designing and producing most of the Wildlife Commission's publications, including* Wildlife in North Carolina *magazine and various booklets, brochures, pamphlets and posters. Here, Art Director Donnan Robbins (foreground left) and Ginny Brown (foreground seated) select colors for a fish poster while Nancy Miller designs an Enforcement Division brochure on a computer.*

annual regulations to the Wildlife calendar, nongame posters and special booklets on deer and other species. First-place ACI awards were won for three publications: the *North Carolina WILD Notebook, Building Bird Houses & Feeders* and the *North Carolina Wildlife Calendar.*

Educational publications designed to coordinate with Field Section activities in Project WILD, CLASS Project and CATCH received perhaps the greatest emphasis and growth during the biennium. A two-year production schedule was adopted. Completed work included the North Carolina WILD correlation, a WILD facilitator's handbook, CATCH student manual and posters and various other Project WILD promotional material, including an introductory booklet, brochure, poster and aquatic software evaluation. Work is under way on

***Children learn important** ecological concepts while playing an enjoyable Project WILD activity with field staff member Ann Hice. Project WILD and CLASS project are two important components of the Commission's environmental education program for teachers and their students.*

KEN TAYLOR

numerous other major publications.

An important part of Publications Section responsibilities is coordination and preparation of displays and exhibits, as well as preparation of all promotional material and coordination of circulation, fulfillment and printing contractual functions for the magazine, calendar and other publications. A special readership survey was conducted for the magazine, and two direct-mail promotions were completed. During the biennium, major assistance was given to the design and preparation of two State Fair exhibits, as well as various other displays or exhibits across the state, including the Dixie Deer Classic.

Promotion of the Wildlife Commission's non-game and endangered species programs, including the tax checkoff, were important functions during the biennium.

AUDIOVISUAL SECTION

Wildlife photography, production of motion picture/video programs and photograph processing and printing are but a few of the many tasks performed by the Audiovisual Section.

During the biennium, the demands for photography increased dramatically. Some 50 percent of the photos used in *Wildlife in North Carolina* magazine are shot by section photographers, who also produce photos for news releases, promotion, special publications, exhibits, slide shows and other projects. In-house production of photos has helped reduce costs while increasing quality. The section also maintains photo files of more than 90,000 color and black-and- white images and supplies these to other agencies and groups, a demand that has grown steadily. During the biennium, the color slide files were placed on computer, and computerization of black-and-white files was begun.

A 30-minute film titled "Bright Waters" that features the Wildlife Commission's fisheries management programs was completed during the biennium and has proven very popular. A 15-minute video on the agency's environmental education program entitled "Project WILD" was also completed to assist teacher workshops. Both "Bright Waters" and the Project WILD video, as well as a number of other wildlife films, may be obtained through the Film Services Branch, Division of State Library, 1811 Capital Boulevard, Raleigh, N.C. 27635, or through local public libraries across North Carolina.

MELISSA McGAW

Tracey Forbes
Promotions Manager

My job is to provide the best promotional coverage for the Commission's programs and projects. It's a special challenge, to take one example, to promote *Wildlife in North Carolina* magazine while staying in the budget.

One asset is a strong renewal program — encouraging past subscribers, gift givers and recipients to renew their subscriptions. We've been very successful at this. Although we can't offer special incentives like a free magazine issue, a billing service, or the use of Mastercard or Visa, we still have an exceptionally high renewal rate.

Last year we designed a readers' survey for magazine subscribers that is helping the editors make improvements. We also used the survey results to design a direct mail piece to past purchasers of L.L. Bean products, with an excellent outcome. Our promotional efforts on behalf of the annual wildlife calendar have caused our sales to double. We've sold out every year for the last five years. I also coordinate promotion of our special Waterfowl Stamp Print Program that benefits waterfowl management.

I get a lot of satisfaction watching worthwhile programs flourish.

ADMINISTRATIVE SERVICES

Quality administrative support for all activities of the N.C. Wildlife Resources Commission is provided by the Division of Administrative Services. Major responsibilities include handling all fiscal transactions, processing all data, and collecting all monies due. The division is also responsible for monitoring transactions to ensure that they are appropriate and that they comply with laws, rules and regulations. Additionally, the division prepares reports for use in management decisions and maintains records of every transaction for statistical and audit purposes.

To do this, sections within the Division of Administrative Services are responsible for specific areas of work.

FINANCIAL MANAGEMENT

This section handles each agency transaction involving revenues or expenditures, including reporting, accounting for, and maintaining records. During the biennium, 22,379 checks were written for expenditures totaling $48.2 million. Revenues collected into the operating fund totaled $50.3 million, and Endowment Fund revenues were $4.7 million.

Purchasing-Mailroom-Stockroom-Warehouse

As with all sections of the Division of Administrative Services, this unit is totally service oriented. Its purpose is to assist and serve all other divisions and sections of this agency.

Since all purchases for supplies and materials exceeding $50 must be by purchase requisition, processing requisitions and orders for all agency employee purchases consumes a considerable amount of time. A total of 2,761 purchase requisitions were monitored to verify compliance with guidelines established by the agency and approved by the State Purchase and Contract Division of the Department of Administration. Purchases for supplies, materials, equipment and services totaled $7.6 million for the biennium.

Postage expenditures during the biennium were in excess of $300,000 for first-class, presorted letter mail and third- and fourth-class mailings for a total of 1.05 million pieces of mail. Fourteen thousand seven hundred thirty-nine items of freight were shipped at a cost of $48,755.

Almost all items for the stockroom and warehouse inventories were purchased from term contracts and therefore were purchased for approximately one-half the cost of retail prices. This has resulted in considerable savings of time and money for the agency. A total of 2,824 stockroom requisitions were received and processed during the biennium.

The warehouse operation has by necessity grown steadily over the years, and the last biennium proved to be no exception. The warehouse is used for receiving, storing and issuing all inventoried stock. A total of 2,963 requisitions were processed during the period.

REVENUE MANAGEMENT

License Sales

The license section is responsible for the sales of hunting and fishing licenses, the collection and deposit of revenues from these sales, and the maintenance of records to account for each license. This

SUMMARY OF OPERATIONS

	1988-89	1989-90
Cash Balance Carried Forward from Preceding Year	$ 2,773,833.42	$ 3,606,151.09
Net Receipts for Year	25,114,231.73	25,244,164.72
Total Available Funds	27,888,065.15	28,850,315.81
Less Expenditures	24,281,914.06	23,973,951.16
Cash Balance June 30, 1989	$ 2,606,151.09	
Cash Balance June 30, 1990		$ 4,876,364.65

Expenditures July 1, 1988 - June 30, 1990

	1988-89	1989-90
Administration		
Administration, Policy & Regulations	$ 649,119.70	$ 755,694.91
Administrative Services		
Financial Management	444,996.18	430,796.97
Revenue Management	693,359.82	758,772.88
Data Processing	415,688.58	413,975.99
Watercraft Titling	.00	71,915.82
Enforcement		
Law Enforcement	9,638,741.54	10,110,014.14
Hunter & Boater Safety	629,630.74	.00
Conservation Education	1,816,411.76	2,020,707.09
Inland Fisheries	3,175,855.70	3,300,772.17
Construction and Maintenance	1,237,227.12	1,291,076.14
Wildlife Management	4,862,640.66	4,417,630.24
Nongame and Endangered Species	441,915.26	396,594.55
Revenues and Transfers	276,327.00	6,000.00
TOTAL EXPENDITURES	**$20,546,291.97**	**$21,457,272.44**

Warehouse Manager *Melvin Jones counts supplies as Joe Holden operates a forklift. The agency's warehouse and supply facilities allow the Wildlife Commission to buy items in bulk — at a considerable savings — and distribute them as needed.*

MELISSA McGAW

ADMINISTRATIVE SERVICES

section, with the help of 1,006 agents statewide, sold 1.4 million licenses, netting $25.4 million in revenues for the agency during the biennium, or 50.5 percent of the agency's operating revenues during that period. The license section also sold 5,879 Endowment licenses, which brought in $1.9 million in revenues. These revenues, plus the interest earned, totaled $20.4 million as of June 30, 1990.

On April 3, 1990, this section became an agent for the Department of Environmental Health and Natural Resources's Division of Marine Fisheries. Licenses that are sold for Marine Fisheries include commercial fishing licenses, oyster, scallop, and clam licenses and seafood dealer's licenses.

Boat Registration

All boats in North Carolina with motors, and sailboats 14 feet and over at load waterline, must be registered. This section registers the boats, and with the help of 229 agents statewide renews the registrations upon expiration. As of June 30, 1990, there were 265,391 boats registered in North Caro-

MELISSA McGAW

***Theresa Castro,** a clerk in Administrative Services, sells the Commission's popular* North Carolina Wildlife Calendar. *She also handles the circulation for* Wildlife in North Carolina. *Administrative Services manages all of the Wildlife Commission's revenues.*

ENDOWMENT FUND

	Interest	Principal
1988-89	$1,340,859.60	$ 914,109.15
1989-90	1,479,966.48	1,013,250.40
TOTAL	$2,820,826.08	$1,927,359.55

REVENUES — July 1, 1988-June 30, 1990

	1988-89	1989-90
Hunting and Fishing Licenses	$12,560,708.17	$12,863,340.67
Bonding — Agents	15,610.00	15,057.00
Motorboat Registration	1,295,185.70	1,283,415.58
Watercraft Titling	.00	62,000.00
Federal Cooperation	5,269,910.22	4,617,431.48
Management Area Receipts	595,277.74	560,043.26
Gasoline Fuel Tax	612,293.45	610,590.00
Transfer from NRCD	50,000.00	.00
Transfer from Revenue — Nongame	440,062.18	446,268.58
Transfer from Revenue — Sales Tax	2,173,540.44	3,005,253.00
Transfer from Revenue — Dept. of Justice	176,000.00	10,527.07
Transfer from Endowment Fund	874,755.92	608,167.00
Sale of Publications	312,506.36	349,868.12
Waterfowl Print Royalty	109,138.50	115,353.50
Sportsman Prints and Stamps	8,358.00	10,172.50
Book Royalty — *Wildlife in North Carolina*	8,703.93	2,378.81
Sale of Calendars	55,034.00	66,935.44
Sale of Prints	6,497.50	4,210.00
Sale of Surplus Property	184,778.00	219,628.65
Rental of State Property	7,118.50	5,581.00
Replacement Costs of Wildlife Resources	34,101.58	40,698.89
Personalization Fees	7,120.00	6,240.00
Fees, Licenses and Fines	47,436.00	58,643.65
Sale of Endowment Items	1,587.91	1,249.55
Sale of Conservation Items	3,876.91	4,043.20
Sale of Listings	19,627.15	40,913.13
Reimbursement of Fish Kills	4,019.93	32,312.99
Creel Surveys	6,000.00	.00
Fish American Foundation Grant	.00	8,000.00
Ducks Unlimited — Marsh Funds	79,641.08	.00
Contribution — Black Bass	1,175.00	.00
Donations	52,368.81	97,735.42
Miscellaneous	101,798.55	98,105.23
TOTAL REVENUES	$25,114,231.73	$25,244,164.72

lina, an increase of 20,724 during the biennium.

It is the boat owner's option to register a boat for either one year or three years, with renewal at the end of that time. More than 125,000 registrations were renewed annually.

This section must handle renewals in a timely manner, which presents a challenge during warm-weather months, the period when most boat owners want to use their boats and the period when most boat registrations expire. With temporary help during the winter months, this section is able to deposit monies received daily and process registrations and renewals within three weeks.

Magazines and Prints

During the past several years the Wildlife Commission has sold stamps and prints to collectors. Artwork is selected annually to be used on the waterfowl and sportsmen license stamps, and prints are also produced from this artwork. This section handled the sale of prints and stamps through art dealers, who sell them to collectors. Sales of subscriptions to *Wildlife in North Carolina* are also handled by this section.

DATA PROCESSING

The primary function of the data processing section is to provide support to Wildlife Commission personnel. Secondary emphasis is on serving the public in such areas as printing motorboat registration certificates and titles, printing hunter-safety student graduation cards, and distributing names and addresses from our administrative mailing list files.

The support work is generally broken down into two categories, routine and special. Routine activities include *Wildlife in North Carolina* magazine subscriber files, CATCH Program, enforcement activities, prosecutions, departmental and Federal Aid accounting, annual hunting and fishing license accounting, Endowment licenses, Project WILD, boating costs, budgetary analysis reports, and issuing taxidermy licenses. Special and annual requests are processed for either-sex deer hunts, fur records, big-game harvest records, wildlife cooperator agents, issuing fox permits, and Roanoke River wild turkey hunts.

WATERCRAFT TITLING

Beginning January 1, 1990, watercraft owners in the state of North Carolina were given the option of obtaining a certificate of title for their vessels. Action by the 1989 session of the General Assembly enacted the optional titling bill. The Watercraft Titling Section was established and three employees were hired. As a result of this new law, the first certificate of title was issued June 15, 1990. A total of 1,500 certificates have been issued, and 2,000 applications are pending issuance of a certificate of title.

MELISSA McGAW

Barbara Hocutt
Supervisor, Revenue Management

My job is to coordinate the production, distribution and sale of the Wildlife Commission's licenses, stamps and tags and to deposit all Commission receipts daily. We handled more than 1.4 million hunting and fishing licenses in the last 2 years.

They include resident and nonresident sportsmen licenses, lifetime Endowment licenses, licenses for fur tagging, blind fishermen, disabled war veterans, permanently disabled residents, rest-home residents, 70-year-old resident sportsmen, and a variety of special-use licenses. Plus we handle the sale of collector stamps, which is a complicated process when collectors want the same number stamp as they got the previous year.

One of my major challenges is making sure that the licenses and stamps are ready by July 1. That's an important deadline because the Commission depends on the revenue from the sale of these licenses. Sometimes we have delays when printers can't meet their deadlines or when the legislature changes the prices at the last minute.

Most of the time we come through, but it sure takes a lot of planning. I never get bored because there's always something new.

PERSONNEL SECTION

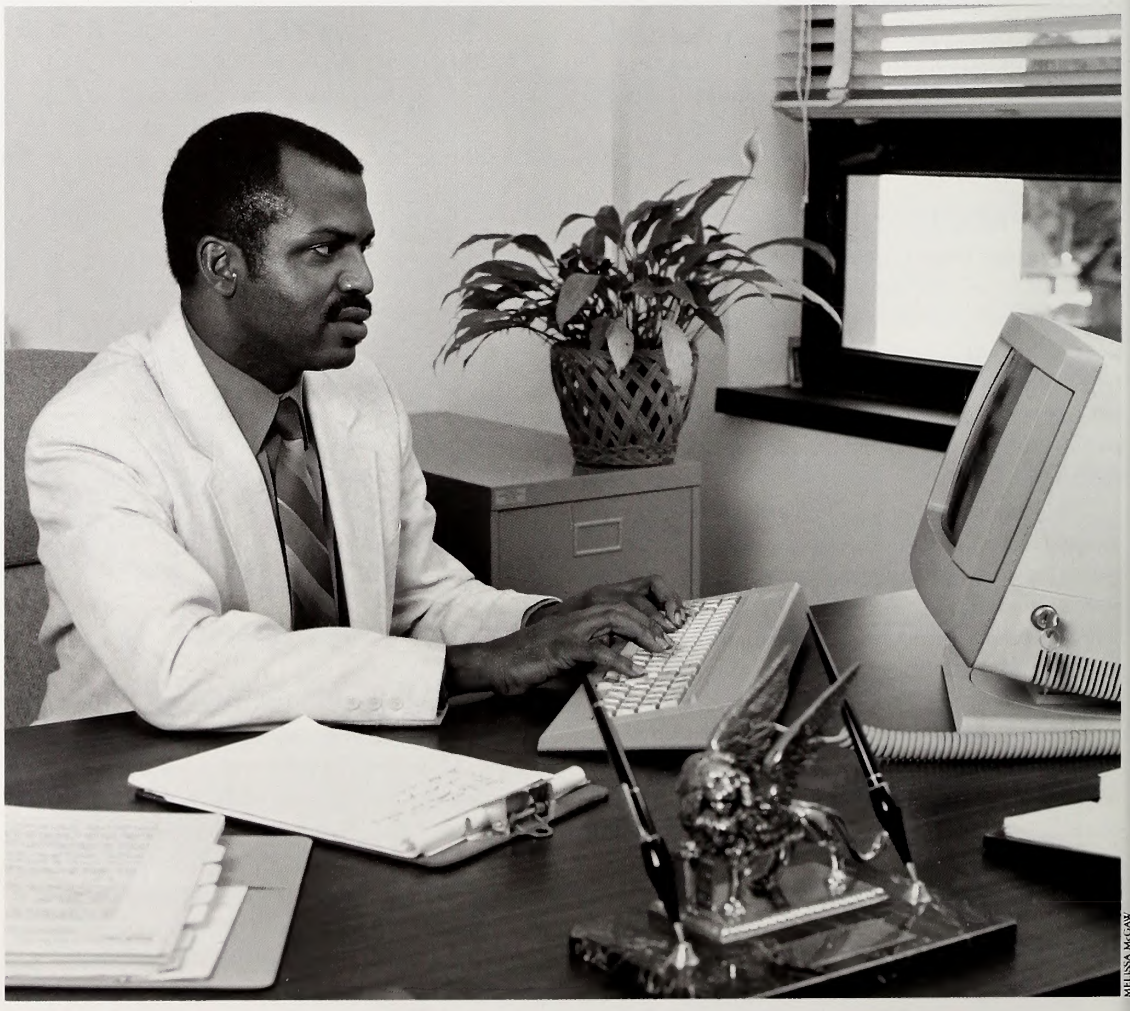
The Personnel Section continues to handle the many responsibilities related to the permanent and part-time employees of the Wildlife Resources Commission. These responsibilities include recruitment, equal opportunity-affirmative action, employee relations, maintenance of the health insurance program and other employee benefits, and a variety of other duties.

During the biennium, Willa B. Deans retired after serving 28 years with the Wildlife Commission, including 10 years as the Personnel Officer. The current Personnel Officer, Larry A. Campbell, has been on board since August 1, 1990.

Pay for performance has been an integral part of the Performance Management System (PMS) because merit increases, except for 1982 and 1989, have virtually been eliminated since 1979. The Personnel Section developed and implemented PMS policy, which replaced the old Work Plan/Performance Review (WPPR) system. This policy outlines the Wildlife Commission procedures for conducting performance appraisals.

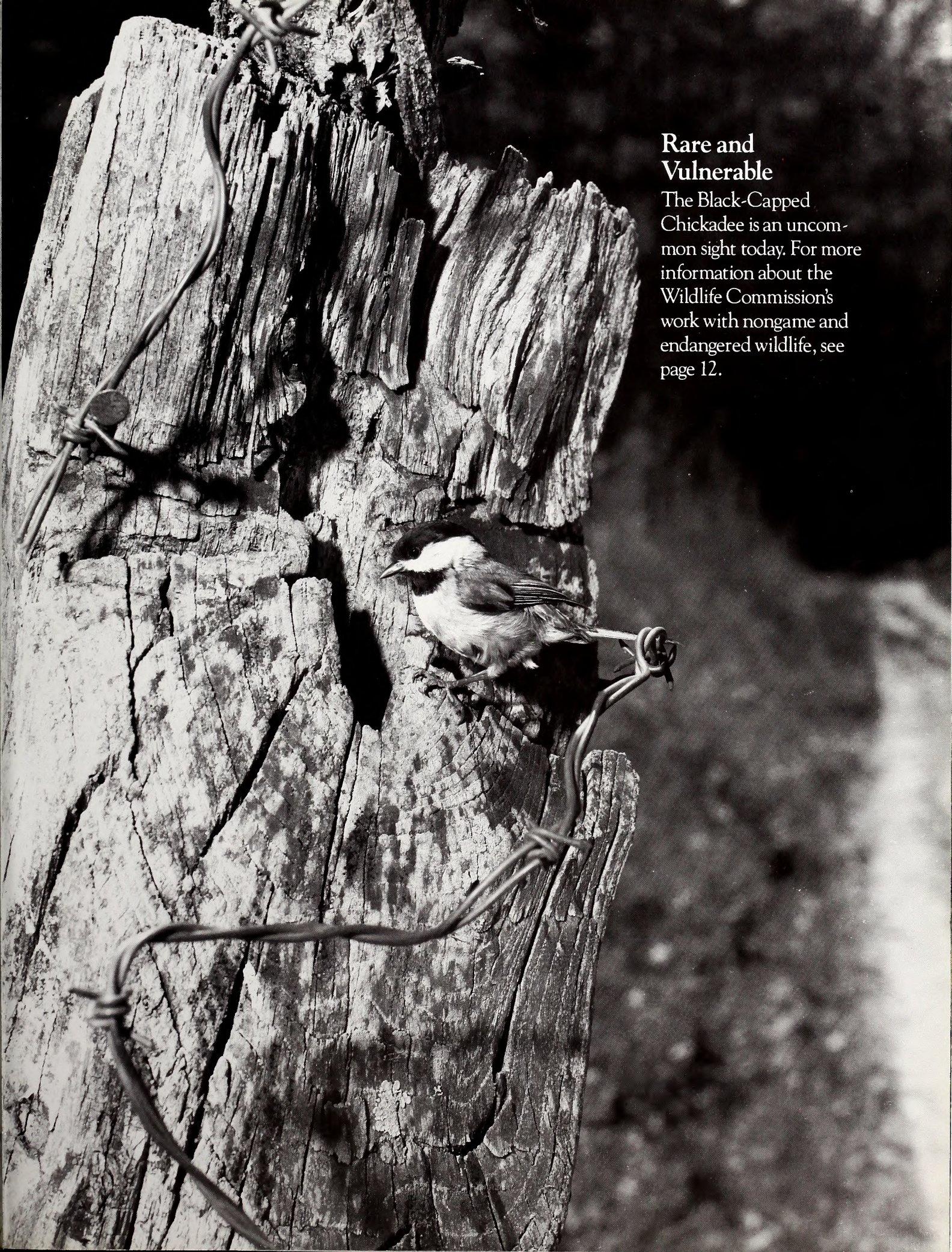
A new program that was introduced to state employees during the biennium is the Voluntary Shared Leave Program. Eligible employees (those with a serious and prolonged medical condition) may apply for benefits from this program. This program provides an opportunity for employees to assist another affected by a medical condition that requires absence from duty for a period of time resulting in possible loss of income due to lack of accumulated leave.

The Personnel Section is committed to assisting all our employees in personnel matters, and it played a key role in assisting our employees who were called to active duty by their reserve/guard units due to the crisis in the Persian Gulf. ⊠



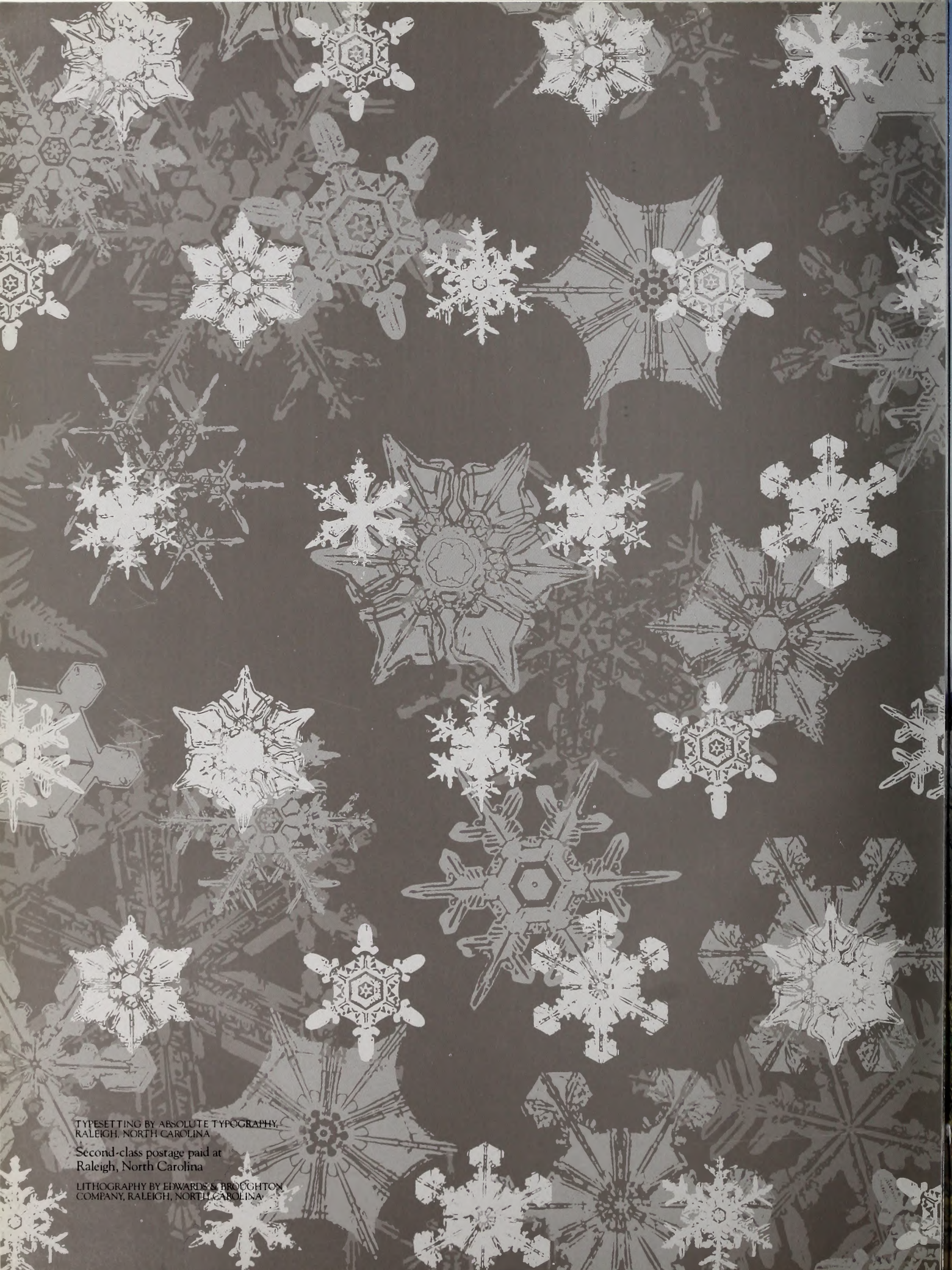
MELISSA McCAW

***Personnel Officer** Larry Campbell heads a section that works with the agency's employees in the areas of employee relations, equal opportunity, health insurance and other employee benefits.*



Rare and Vulnerable

The Black-Capped Chickadee is an uncommon sight today. For more information about the Wildlife Commission's work with nongame and endangered wildlife, see page 12.



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WILDLIFE IN NORTH CAROLINA

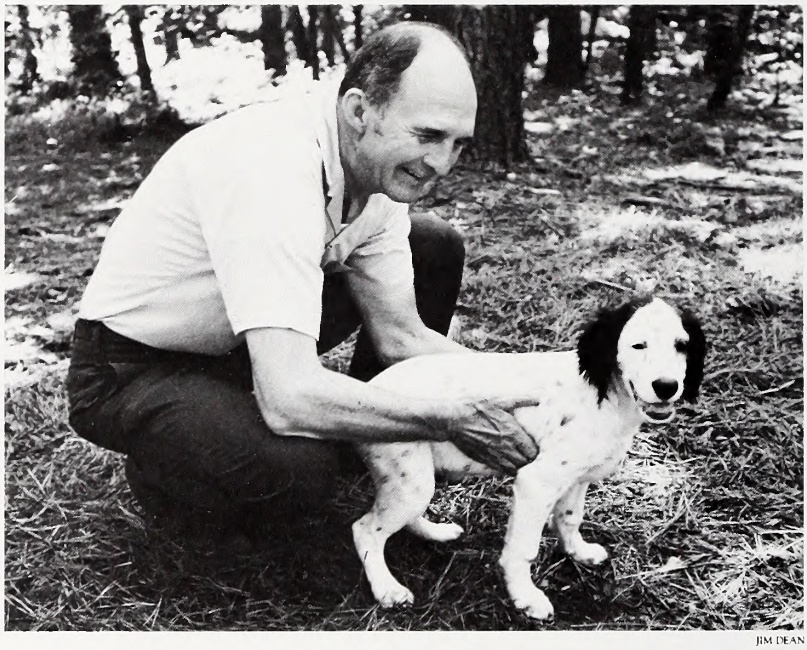
FEBRUARY 1991 $1.50

Dogs Are a Better Class of People

by Jim Dean

My brother's Labrador retriever is beginning to get more than a little gray around the muzzle, prompting the suggestion that we might need to get him some Grecian Formula so that he can keep up appearances. It's the least we could do for our old buddy. Unfortunately, dye can't hide the fact that John's grand old dog is winding down a career that has been an essential part of many memorable moments in duck blinds, boats and marshes across North Carolina for the past dozen years.

How can you not love a dog that shells his own peanuts in the blind, and once guarded a bunch of black walnuts for days while trying to figure out how to gain entrance? How many dogs do you know that like raw oysters? Okay, but with horseradish and catsup? Then, there's the time when cash crossed palms because, against all bets, John's Lab ate a pickled beet. Liked it, too.



JIM DEAN

What I will always remember best, however, is a hunt a decade ago when this then-youthful dog refused to give up on a crippled Canada goose. The goose was only slightly injured, and it quickly gained the cover of a swamp several hundred yards across a frozen impoundment. We figured we'd have to get it on the way out, but my brother's Lab ignored all orders, whistles, screams and threats. He lunged against the rafts of ice, breaking a ragged trail across the impoundment and finally disappeared into the woods.

Time dragged, and we were beginning to think we had a lost dog when suddenly the binoculars revealed a black speck on the distant dike. After pausing a moment, the Lab plunged in and began to break ice carrying a heavy, and not altogether cooperative, load. I still have the photograph of John's dog covered with rime with his paws on the last shelf of ice in front of us, proudly delivering that goose. Physically, he couldn't do that today, but I'll bet his heart would make him try.

Every breed—indeed, every individual dog—has characteristics that seem particularly human. Like people, some dogs seem to have a sense of humor, while others develop qualities that mirror the interests and character of their owners. Surely, John Rucker's remarkable springer spaniel, Barney, whose story is told beginning on page 12, shared his owner's love of fishing. The only time I was privileged to meet Barney, he and John were fishing for trout on the Smith River. If, in Barney's opinion, John was not catching enough fish, Barney would look elsewhere along the river for rising trout. Then, he would encourage John to follow him. "Try these down here," I could imagine him thinking, "you've already spooked those up there with all that sloppy casting. By the way, they're taking size 24 blue-wing olives." And like his owner, Barney practiced "catch and release," clamping the trout he retrieved so gently they could be turned back unharmed.

Yet, almost all dogs, like children, can be supremely frustrating. My Dad's lovable old pointer, Buck—the original "Pointer of No Return"—has gone to that great pea field in the sky, but during his terrestrial tour, he loved to hunt bobwhites better than he loved liver leftovers. The only problem is that he preferred to hunt them alone. We were never certain whether this was simply because he wanted to compensate for our disability (having only two legs), or whether he thought we tended to get in the way when birds were found. The result was that for a dozen years or so, Buck hunted birds and we hunted Buck. Yet, towards the end of his life, he mellowed and sometimes even stayed in the same county as though he wanted us to share in his great adventure. We did, of course, until his time was up. We still miss him fiercely.

Buck was followed by a setter named Jake who has managed to maintain puppyhood for 14 years, no small achievement in itself. Unlike Buck, Jake actually likes for us to accompany him on the hunt and, in keeping with his uncommon consideration for others, he believes in equal opportunity for all species. Thus, he will point a sparrow, box turtle or house fly with the same intensity that he might lock up on a bobwhite or timberdoodle. "You trained me to point, so I'm pointing," seems to be his credo. Say what you will, it keeps us on our toes, and Jake never lies. That's a fly, all right. Good boy.

In dog years, which is the way I prefer to keep count these days, I am only about seven years old, but my muzzle is already more than a bit grizzled, and I've had enough experience with dogs to wonder about one thing. Was it simply an oversight that humans were given a lifespan of seven or eight decades, and dogs got just a bit more than one? The only thing I can figure is that this sad disparity must be part of the plan. Otherwise, sensible men and women seeking only the highest qualities in a mate would surely have married dogs.

February 1991
Volume 55, Number 2

State of North Carolina
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Health, and Natural Resources

William W. Cobey, Jr. / Secretary

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WILDLIFE IN NORTH CAROLINA

Wildlife in North Carolina is the official educational publication of the North Carolina Wildlife Resources Commission, and is dedicated to the sound conservation of the State's wildlife and other interrelated natural resources and the environment we share with them.

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4 **Hit or Myth Snipe** *by Raiford Trask*
There really are snipe. Not only that, they're abundant, fun to hunt and very tasty. But they're as tough to "bag" as ever.

8 **Quail by Appointment**
written and photographed by Joel Arrington ©1991
With quail numbers down and places to hunt dwindling, private shooting preserves may offer more than just a place to train dogs or ensure a successful hunt.

12 **The Barney Years** *written and photographed by John Rucker* ©1991
In my life there was a time that began with the acquisition, and closed 14 years later with the death, of a dog named Barney.

20 **Cataloging Critters** *written by Alan Boynton*
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How do you inventory all of the hundreds of possible species of wildlife on 300,000 acres of game lands? And why?

24 **Asleep in the Deep** *written by David S. Lee*
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Back of the Book *by Vic Venters*

Wildlife Through the Year *by Vic Venters*

Cover *Bobwhites flush in front of the guns and dogs on a shooting preserve. Photograph by Joel Arrington*

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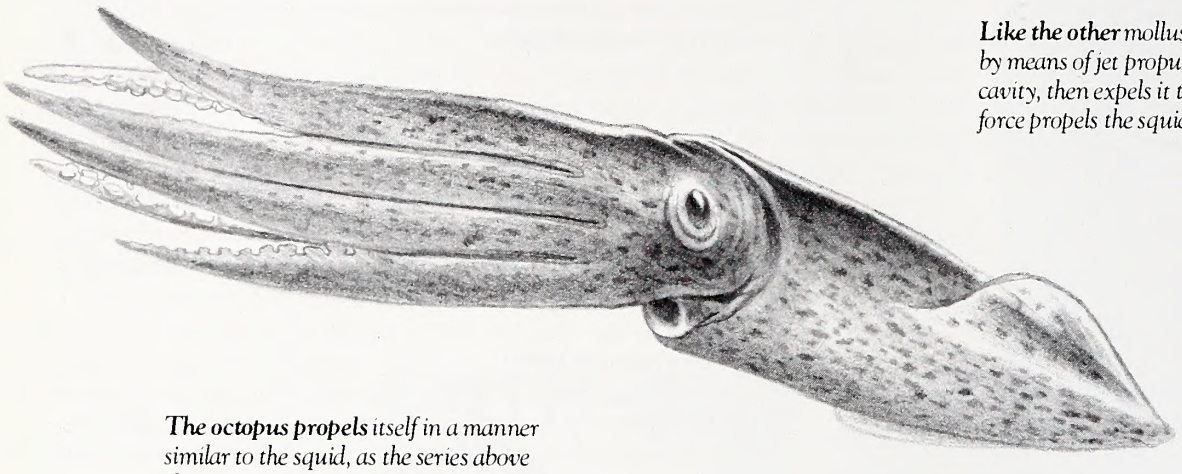
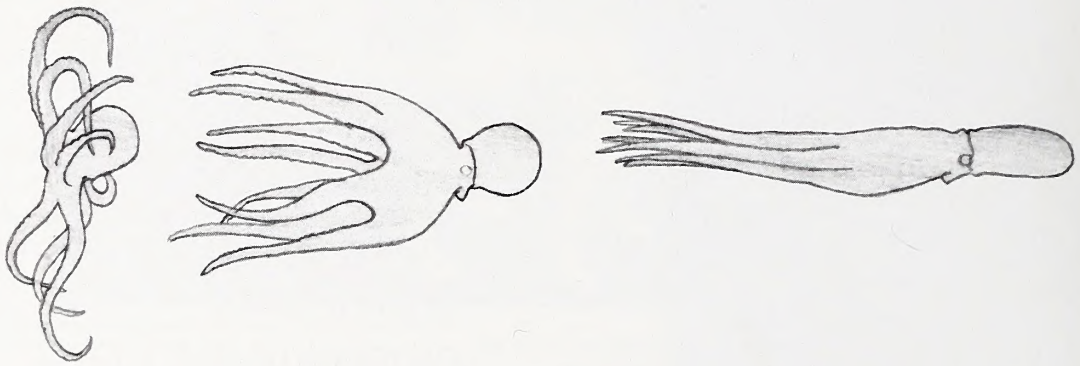


Like the other *mollusks pictured here, a squid moves by means of jet propulsion. It draws water into its mantle cavity, then expels it through a nozzle-like siphon. The force propels the squid in the opposite direction.*

The octopus propels *itself in a manner similar to the squid, as the series above shows. Wanting to move away from an enemy approaching from the left, it first moves slightly to the left to fill its mantle cavity with water. Then it contracts its cavity explosively, expelling the water from its siphon. The force drives the octopus to the right.*



Jet Propulsion

written by Lawrence S. Earley / illustrated by David Williams

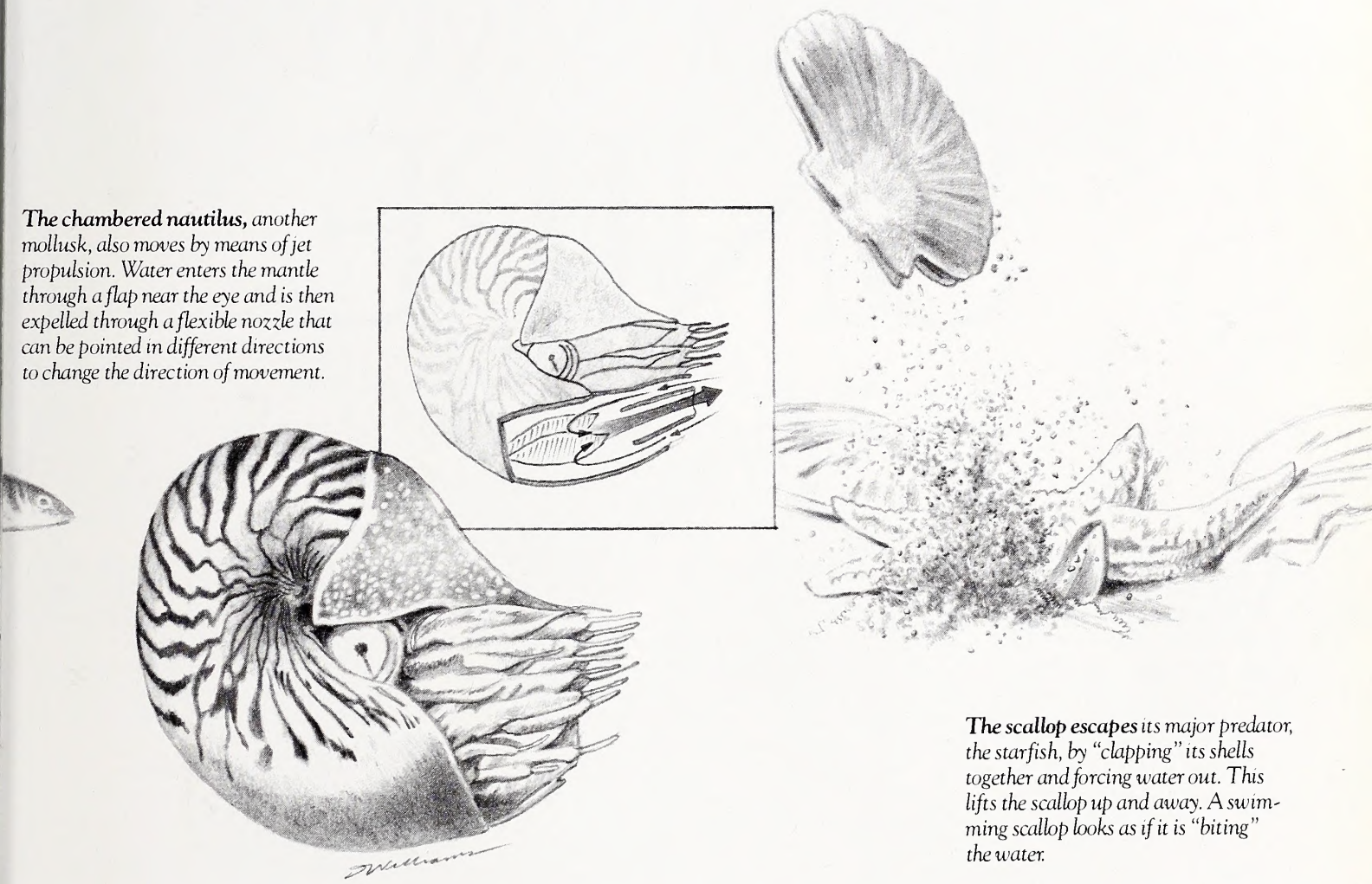
High in orbit around the Earth, a satellite makes a critical course adjustment by firing a jet rocket through a tiny nozzle on one or the other side. The principle is the same as the rocket power that propelled it into space in the first place: a force in one direction creates a counterforce in the opposite direction.

Some aquatic animals do the same thing. Indeed, the principles of jet propulsion have been practiced for geological ages, evolved by jellyfish and especially by several resourceful members of the mollusk family — the scallop and the squid.

Mollusks comprise about 80,000 species that are organized into seven different classes. Though scallops, squids and octopuses and chambered nautiluses don't look at all alike, they are all mollusks and all of them move about in very much the same way.

The scallop is a bivalve mollusk whose bottom shell is convex, or dish-shaped, flat while the top one is convex. Within the shell are the internal organs (and the giant muscle that we eat) that are rimmed by a kind of curtain called the mantle. Amidst hundreds of waving tentacles are scores of alert, blue eyes.

Most of the time the scallop is content to sit quite still, anchored to rocks or sand and feeding on minute pieces of vegetation that it filters from the water. But enter the starfish, its major predator. A starfish would like nothing better than to pry the scallop's shells apart and feed on the soft muscle inside.



The chambered nautilus, *another mollusk, also moves by means of jet propulsion. Water enters the mantle through a flap near the eye and is then expelled through a flexible nozzle that can be pointed in different directions to change the direction of movement.*

The scallop escapes *its major predator, the starfish, by "clapping" its shells together and forcing water out. This lifts the scallop up and away. A swimming scallop looks as if it is "biting" the water.*

Goodbye scallop. Often enough, however, the alert scallop sees its attacker and suddenly jets away.

It moves explosively by taking in water within the mantle and expelling it as if from a nozzle from any point on the perimeter of the shell. The force of the expulsion propels the scallop in the opposite direction.

The scallop can also swim for some distance by clapping its shells together repeatedly. The water is forced out on either side of the hinge, propelling it forward. Some have described a swimming scallop as "biting" itself through the water.

Although the squid doesn't look at all like the scallop, it also is a mollusk and it has learned the value of jet propulsion. Squids lost their shells long ago. At the top of the squid's body, and surrounding its internal organs, is the "mantle," a muscular tissue that functions much like a scallop's mantle. At the squid's other end are long tendrils with suckers. The squid gets oxygen by drawing water into the mantle cavity and over its gills and then expelling it through a funnel or siphon that hangs beneath the body.

Unlike its scallop cousins, a squid is predatory. When it wants to attack it draws water into its mantle cavity and expels it explosively, propelling it in the opposite direction. By pointing its funnel up, down or sideways, it can move headfirst in any direction it wants. Yet it is able to adjust its direction with delicate movements to follow the twisting of prey or to escape the occasional enemy. It can move fast. Some species have been timed swimming 23 miles per hour, and some explode upward with such force that they hurtle 20 feet into the air above the water's surface, often landing on ships' decks. Squids swim for longer distances by undulating their flexible fins.

The locomotive feats of the aquatic mollusks are rivaled, perhaps, only by man's mastery of rocket power. But mollusks have been doing it a lot longer.

Hit or Myth SNIPE

There really are snipe. Not only that, they're abundant, fun to hunt and very tasty. But they're as tough to "bag" as ever.

by Raiford Trask

We had been walking down the barren field with the cold January wind in our faces for nearly 20 minutes. I had just finished my dissertation on the challenge of gunning for common snipe when I heard a yell. I turned to see George Humphrey lying prone in the mud.

"Well, at least we know the field is wet," I said. "If you have water, you can usually find snipe."

"No wonder so few people hunt these birds," George replied with uncommon restraint.

I laughed and took his shotgun while he struggled to his knees in the sinkhole. His face and previously immaculate upland gunning togs were covered with wet, black mud. I had invited George, an accomplished waterfowler and white-tailed deer hunter, for what I had hoped would be an eye-opening hunting experience with the common snipe. Getting an eye full of mud was not what either of us bargained for, and I was beginning to worry that George might not get a chance to test the sporting qualities of this little-known game bird.

The weekend weather forecast had been promising, leading me to believe that the first big winter flight of snipe would be arriving from the north to begin feeding in the farmlands and impoundments of eastern North Carolina. There had been a slow but steady drizzle for three days, meaning the farms around Wilmington would have water standing in fields and pastures. The New England states had been frozen solid for several weeks, and now Maryland's Eastern Shore was under 4 inches of fresh snow.

Despite these ideal conditions, we had walked nearly half of the mile-long field without flushing a single snipe. George had managed to locate two sinkholes, the first giving him a boot full of cold water, the second a three-figure dry cleaning bill. Fortunately for our friendship and his education, we found the snipe 30 yards farther up in that muddy field, where it was even muddier.

The first bird flushed to George's right, gave the odd quack a snipe gives when it goes airborne, then curved into the wind on quick wings, presenting both guns with a crossing shot at 35 yards. At the sound of our shots, another five birds flushed to my left, close enough for me to make out the long bill and long legs that dominate the snipe's appearance. I fired the two shells remaining in the Browning at these birds with no results. George shot at the first bird again but missed. We reloaded and walked forward with the black ooze sucking hard at our boots. Snipe jumped from nearly every position on the clock, flushing hard and low before turning into the wind to gain altitude. I missed a bird in its swerving rise before connecting on a snipe quartering away. George missed two more birds, then made a fine shot on a snipe flushing straight down the field. We recovered our snipe and continued walking.

Twenty minutes later, George was out of shells and I had but two left. We had started with three boxes between us. I was still one bird short of my limit, while George had taken two snipe. I handed my two shells to him and he downed a rising, twisting bird with his last shot. We found the bird in some broomstraw at the edge of the field. As George held the mottled gray, almost khaki-colored bird in his hand, I could see that the small clan of snipe-hunting aficionados had enlarged its membership by one.

The common snipe's mythical counterpart may be the most overhunted species in the country. Who has not held the bag and flashlight in his callow youth? Yet, even as adults, when we learn there really are such creatures as snipe, very few of us actually hunt these migrating game birds. Although the common snipe, along with other shorebirds, was hunted heavily in the early 1900s, the season was closed nationally from 1941 to 1954. However, the birds have never regained popularity with sportsmen. Snipe are occasionally taken by waterfowl hunters or by upland hunters who venture into lowlands in search of quail or woodcock, but hunters who begin their day afield with the common snipe as an objective are rare indeed.

The relatively avid snipe hunters have learned that hunting is usually best in wet areas that feature little or no tall vegetation.

***The author dropped** this snipe in an overgrown wet field in Piedmont North Carolina. Challenging targets, snipe winter in North Carolina in large numbers or pass through when cold fronts push them south.*

VIC VENTERS

***Snipe can be** found in a variety of habitats — almost anywhere it's wet. Waterfowl impoundments, freshwater marshes, boggy agricultural fields and wet cow pastures are all excellent North Carolina snipe hunting grounds. Snipe use their long bills to probe moist soil for worms, crustaceans, insects and other food.*

Snipe feed on grounds that are thoroughly saturated and standing water will usually be present. This obviously produces mud or muck that is wet enough to stall a panzer column. Since snipe do not swim, favorable areas must have enough dry ground for the snipe to walk or wade. The old-timers called these locations "bogs," a term that includes drained waterfowl impoundments, wet agricultural fields, marshes and the edges of swamps. Cow pastures that have sufficient moisture are also possibilities, and tall rubber boots are recommended in all good snipe cover.

Public hunting opportunities are best in large waterfowl impoundments during the period when they have been drained. The ground will retain enough water to hold snipe, as well as the organisms that comprise the snipe's diet. The impoundments at Goose Creek usually offer good snipe shooting on public land, and Gull Rock in Hyde County and the White Oak River Impoundment may also attract a good number of birds. Snipe are also found on public game lands in the central portion of the state, particularly those at Falls of the Neuse. Steel shot is required at these locations on game lands and some other areas as well, so be sure to check before you go. On the private side of the fence, landowners are generally more receptive to queries from upland game hunters after the close of deer season on January 1. Since the best snipe shooting occurs in the months of January and February, the snipe hunter may be able to gain entry to some very productive private land through either a personal visit or telephone call to the landowner.

Snipe hunting tactics call for walking, and sometimes tall rubber boots are high enough, although hip boots or waders may occasionally be necessary. Hunters usually walk abreast through the bog in typical upland gunning fashion, with enough space between them to cover the area as adequately as possible. At times, the snipe will sit extremely tight and the hunters should be prepared for close-quarter flushes, often between hunters. In this instance, firearm safety is of the utmost importance. No shot should be attempted until a bird is well clear of the hunters. Poor footing associated with snipe bogs makes safe gun handling all the more important.

When a snipe flushes, it provides what may be the most challenging of all upland targets. The bird will usually alert the hunter by calling as it flushes then swerve from one side to the other as it flies quickly away, offering a very small target. One good tactic is to wait until the snipe reaches level flight. Obviously, the distance of the flush from the hunter determines the prudence of this strategy.

Any good upland shotgun can be used for snipe, with the same type of open-choked, side-by-side double favored by quail and woodcock hunters being the most popular choice. If you are hunting snipe in any of the waterfowl impoundments where the chances of total immersion for both the hunter and the gun are fairly high, your less-valuable water-fowling gun equipped with an open choke would be the best call. In fact, a 12-gauge automatic or pump equipped with the new variable chokes is ideal for common snipe on any terrain. Shot sizes should be small, and #8 or 9 shot is standard, although 7½s are used with good success on birds that tend to flush at greater distances.

The snipe's plumage allows it to blend notoriously well with its environment, making proper marking of downed birds and good

dog work essential. The dog must have a good nose and be trained to work close or heel. Dogs that range far downfield in the typical quail-hunting style will flush snipe out of gun range. While the labrador retriever and the Boykin spaniel are two breeds that have distinguished themselves in the snipe bogs, any retriever that is trained well enough to heel or hunt closely for long periods of time can be employed with success.

Although the common snipe is unfamiliar to many hunters of this era, its range includes both American continents, and it inhabits marshy areas from Alaska to Venezuela. Snipe are also present in Europe, Asia and Africa. Throughout their range, snipe exhibit nesting and migratory habits that closely resemble those of waterfowl. The snipe breeds on wetlands in our northernmost states and in Canada and Alaska. Male snipe arrive at the nesting grounds some two weeks before the females, and they develop their own nesting territories. When the females arrive, the male snipe perform acrobatic displays that include diving straight down from heights of 300 feet and landing beside a prospective female. This performance, known as winnowing, will be repeated as many as eight times in a minute. Following the mating rituals the female will lay four eggs and incubate them for about 19 days. Snipe chicks weigh less than ½ ounce when born. The oldest two chicks are led away from the nest by the male, who rears them separately, while the female cares for the two youngest chicks (how's that for liberated child care?). The chicks grow rapidly, being fed by the parents for the first 10 days of their lives. They are able to fly short distances when two weeks old and able to sustain flight three weeks after hatching, when they weigh about 3 ounces.

Snipe begin migrating south during the full moon in August or in the early autumn months. They are rarely found on the East Coast north of the Chesapeake Bay after the coming of the new year, but they winter as far north as Washington on the West Coast.

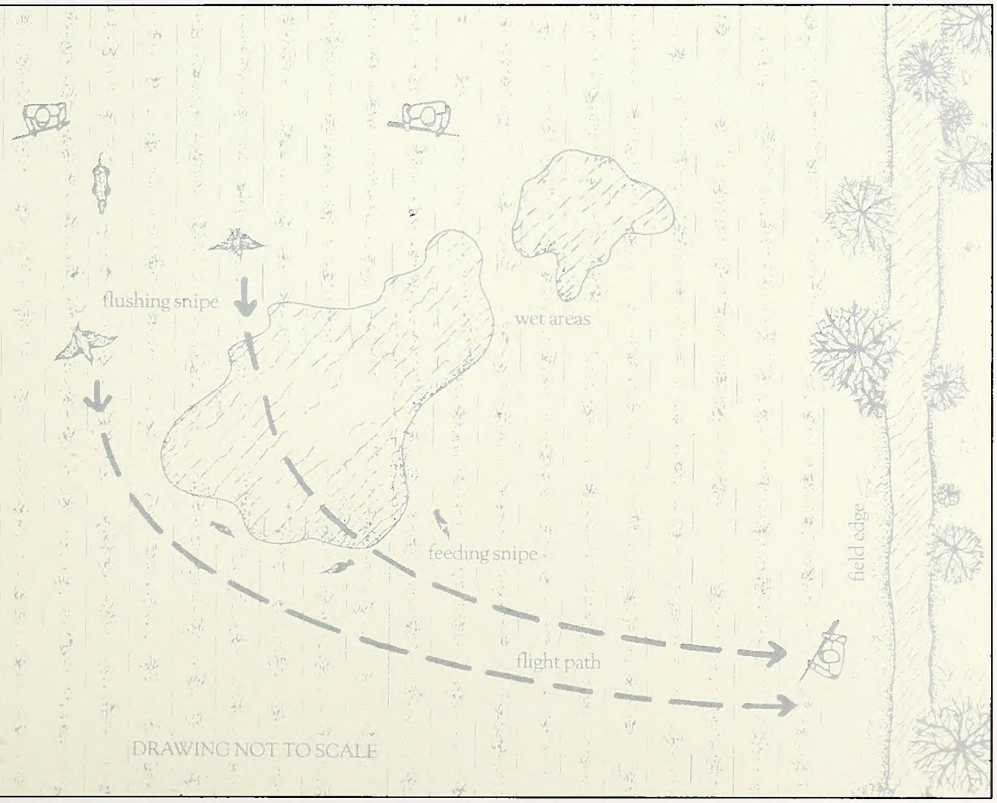
Ground conditions and impending cold fronts are a good yardstick for predicting the snipe's arrival in North Carolina. The snipe uses its long beak in the same manner as the woodcock, piercing the ground and capturing the insects, earthworms, crustaceans and mollusks that comprise its diet. The ground must not be frozen, and snipe will usually migrate south in spectacular numbers prior to a severe cold front. This is when the old-timers would shoot snipe and other shorebirds in large numbers. Snipe, however, have apparently been less affected by loss of habitat and the threat of pollution than other shorebirds and are still available in large numbers. Increased management and conservation of wetlands should continue to ensure a large population. With waterfowl populations decreasing, more North Carolina hunters may discover the challenge and pleasure of hunting snipe. The bird has a lot to offer, including a long open season and a large wintering population. It's also a difficult target, but a tasty one for those who bag enough for a meal. By "bag," of course, I don't mean waiting for those mythical birds of your youth. ☒

How to Eat Snipe

Recipes for common snipe are not found in the trendy fish and game cookbooks found in most kitchens these days, but not to worry. It doesn't mean snipe are inedible. Indeed, the snipe has a delicate flavor, lighter than dove or woodcock but a little more flavorful than quail. Snipe should be breasted like a dove when dressed, then kept cold prior to cooking. You can use any good quail or pheasant recipe. One hard-and-fast rule is not to overpower the delicate flavor with heavy spices. Serve the breasts on a bed of wild rice with green beans or asparagus and a nice white wine. The meal will be well worth the five-mile trek through knee-deep mud, and maybe even an inadvertent closer acquaintance with that mud.

The Snipe Shuffle

***Chip Robinson of** Wilmington popularized this snipe-hunting technique that is particularly well-suited to the long, boggy fields found in eastern North Carolina. With the "Snipe Shuffle," one shooter advances along the edge of the field 50 to 100 yards in front of the hunters walking down the middle of the field. Inevitably, some snipe will flush out of range of the hunters in the middle of the field. However, the bird's habit of circling away when flushed will many times carry the snipe directly over the hunter at field's edge, affording excellent pass shooting. Extra caution should be taken to ensure that hunters shoot in a safe direction.*



Quail by Appointment

With quail numbers down and places to hunt dwindling, private shooting preserves may offer more than just a place to train dogs or ensure a successful hunt.

written and photographed by Joel Arrington ©1991

Terrain near Kenansville rises gently in grain fields and pastures and dips to ponds and bottoms. Here is geologic relief and variety for the hunter, compared to piney flatwoods of the Coastal Plain just a few miles southeast. Bobwhite quail flushed from fields head for the woods like bobwhite quail everywhere. They've got to be routed out.

In a bottom thicket on the Old Spicer Farm Shooting Preserve, two almost totally white pointers of respectable lineage and impeccable manners were of considerable help, but Fiddling Blackwater (call name "Ricky") and Airborne Chief ("Sam") couldn't make me shoot straight. Bill Faust, a professional trainer from nearby Warsaw, had brought them in for a photo session. They were as nicely finished as any bird dogs the preserve guests had seen and justifiably the objects of our admiration and Faust's pride. Thanks to classy dogs and the unerring marksmanship of Jim Morgan, our chore in the bottomland became short work.

"Dead. Hunt dead," Faust called repeatedly to the dogs in the old singsong command that has become a mantra for bird hunters. Come here and sniff out this downed bird, it means, and fetch it to me and we will proceed with our ritualistic reenactment of ancestral food gathering.

***It takes quick** reflexes to bag a bobwhite that flushes in the woods, even when the birds have been pen-raised. Shooting preserves afford opportunities for hunters who don't have dogs or access to private land where there are wild quail..*

We hunted on up the rise, flush with success and glad to be out of the greenbrier, into a brown millet field through which lanes had been mowed for easy walking. Customers of modern shooting preserves alternate between tough conditions and some that could have been prepared for European royalty. The dogs systematically cut through the millet, working into the slight breeze of a mild winter afternoon. They found birds where the going was easy and my missed shots were all the more obvious.

But what is a shooting preserve for if not to polish rusty shooting skills? Well, it's a place to use and train dogs. It's a place to get away for a few hours of recreation where you know for sure you have action. And it's a place to get a feel for something valuable that is gradually slipping away.

Any hunter who has fed a dog all year, paid the vet and searched for land where he can find a few coveys knows well the time and money required. Not everybody has access to or can afford wild bird hunting. Even if they do and can, not everyone is willing to commit the time.

Because wild bobwhite quail hunting has been slowly declining across the South for at least 50 years, the number of shooting preserves has increased. Land-use practices no longer yield much of the habitat best suited for natural reproduction of the brown and white birds. Unless landowners make a special effort to foster quail — and many do in North Carolina — local populations will dwindle and disappear. The species is not even remotely in any kind of trouble, but huntable populations of wild birds are increasingly thin in virtually every state.

Since the Second World War and up until the last few years, there was an escalating world demand for soybeans. High prices called for big fields in which heavy machinery could be efficiently used. There was a tendency, therefore, for small farms, which historically had good quail hunting, to be consolidated into large ones. The result was efficient farming but reduced edges and fewer corners. That means less cover for quail. The phenomenon occurred throughout the South and remains a principal cause of the decline of wild quail hunting.

The other main causes are herbicides and pesticides. Carl Betsill, small game coordinator for the N.C. Wildlife Resources Commission, said that soybean fields have fewer weeds and insects in them now than 20 years ago. "The direct toxic effect of pesticides on quail may not be the most damaging effect," he said. "It's the destruction of food items."

State wildlife agencies have been struggling to hold on to what remains of bobwhite habitat. In North Carolina, programs of technical assistance to landowners, distribution of plant materials, and research have been in place for years.

Betsill said that biologists in each of nine districts look at land and give owners technical advice on habitat improvement. The Wildlife Resources Commission provides free plant material — seed and seedlings — and conducts surveys of quail hunters to monitor success, which has been declining.

Professional managers like Betsill point out that quail density depends on the variety of quality habitat available during such critical periods as the nesting season and the coldest weeks of winter. If one particular type of habitat is in short supply, he said, no amount of another type can overcome it. There must be enough suitable quail food and cover during four seasons. Betsill said that bobwhites like young plant growth. Annual plowing and burning are recommended. Thickets like the Spicer Farm bottoms are critical for escape and quail loafing cover. Scattered trees provide nuts, seeds and fruits. Managers say modest adjustment in normal farming and forestry practices can go a long way toward improving quail habitat.

With the development of vast new bean farms in the U.S., Africa and South America, supply caught up with demand a few years ago. Soybean prices fell and the tendency toward big fields may have slowed in a few counties on the Coastal Plain.

In Bladen County, southeast of Raleigh, some farms escaped consolidation. Many small to middle-sized fields remain, and quail habitat on some has been increased with management practices encouraged by the Wildlife Resources Commission. Quail populations are good.

Rudolph Inman and Jimmy Davis, veteran quail hunters, showed me 10 coveys one February day, with an average of 15 to 20 birds per covey. One must have had over 30.

Inman, a retired businessman, said he had been hunting the same coveys throughout the county for 50 years. "Many are in the same places they always were," he said, "and I have hunted with men who themselves hunted those same coveys for fifty years before me."

Davis and his pointers look for soybean stubble next to cut-over forest in the first stages of plant succession. "Quail roost and nest in the heavy low growth," he said, "and they feed out into bean fields once or twice a day."

We found most of the coveys that afternoon in the edges of woods, as it had been raining and the birds had not moved far from their roosts. Using a spot-hunting technique, we hit perhaps 15 locations, never walking more than a half mile from the truck. The strategy depends entirely on permission from landowners, but that was no problem to these long-time residents. Visitors would have little chance of finding good hunting.

While nearly all wild quail hunting is on private farms, there is some limited opportunity on public lands in North Carolina. The Butner Game Land near Durham is heavily used because it provides the only public quail hunting near the Research Triangle population center. North Carolina's eastern game lands, while they may have some quail, are managed primarily for deer; those in the mountainous west are largely unsuited for quail.

Shrinking habitat and diminished public access, therefore, stimulated proliferation of private shooting preserves like Old Spicer Farm where hunters may pursue released, and sometimes a mixture of pen-reared and wild, birds in often ideal conditions. The preserve has a kennel of able dogs, and hunters may work their own. Manager Bruce Jones offers a hunting dog training and boarding service, as well. Hunters are guaranteed 12 birds for the daily fee of $150, which also includes breakfast and lunch. Additional birds are $6 each. Quail are dressed and packaged for the hunter, who must bring only gun, shells and a hunting license. Extra shells may be purchased on the premises.

One day Bill Mays and I coursed over the preserve with Jones and a white dog named Luke. Only 18 months old, the muscular canine hunter with liver ears performed admirably most of the time, working close and showing potential for great accomplishments in his lifetime. Big-working dogs bred and trained for field trials are not so well suited for shooting preserves as those which tend to remain close to the guns.

Luke found a small covey in a strip of rye. We moved up and four of the birds flushed. Mays took one going straight away and I dropped one just before it made the woods.

***Some shooting preserves** offer only the basics, while others provide meals, wagon rides and the flavor of an old-fashioned hunt. With opportunities on private land dwindling, preserve hunting is likely to become more prevalent.*

***Almost everywhere, bobwhites** have forsaken the open fields and taken to the woods where the terrain is often rugged and the shooting tough. Even on many shooting preserves, hunters should be prepared to hunt cutovers and thickets.*

"Still one left," Jones said. He took a step toward the creeping quail plainly visible in the short grass. Luke, not far out of puppyhood, remained locked on point. The bird did not, would not, fly. Finally, Jones threw his hat at it and the bird sprang from the grass and headed toward the tall pines. My two shots only hurried it onward to its quailbird destiny, admittedly bleak.

Okay, preserve quail hunting is not wild bird hunting. Some people don't like it because it is not a perfect simulation of the real thing. I wish it were better. Everyone does, but preserve managers do what they can to give the hunter an experience as close to wild bird hunting as possible. Old Spicer Farm, for example, liberates flight conditioned birds far in advance. Only after the birds are seasoned are they hunted.

Preserve practices vary widely, as does the degree of fidelity to wild bird hunting. Some try to simulate not only authentic hunting, but days gone by. Hunters at George High Plantation, near Roseboro, for example, may elect to hunt from a mule-drawn wagon. Some guests find that pace too slow, however, and prefer the truck.

Shooting preserves may not be the answer for the purist, but for many hunters they provide a satisfactory experience and good opportunity for shooting practice and dog training. No doubt they also serve well to introduce novices to hunting and to provide a glimpse of what traditional Southern bobwhite quail hunting used to be.

Lightweight shotguns of 12 down to about 20 gauge are generally considered to be most appropriate for bobwhite quail. Experts can hit with the smaller gauges, but they are a handicap for anyone else. Barrel lengths are usually 28 inches or less, choked improved to full for wild birds, which tend to flush at a distance. On preserves, where birds are likely to hold tightly, cylinder bore is functional.

The most common shotshell is 12 gauge with 3¼ drams of powder driving 1¼ ounces of #8 shot. The equivalent in 16 gauge would be 2¾ drams and 1⅛ ounces of shot. Some quail shooters prefer #9 shot for slightly denser patterns, others have confidence in size 7½ for clean kills at distance. For far-flushing birds, 1¼ ounces of #9 shot loaded with 3¾ drams of powder achieves a little additional reach.

You can get a list of controlled shooting preserves free by writing the Division of Wildlife Management, N.C. Wildlife Resources Commission, 512 N. Salisbury St., Raleigh, N.C. 27604-1188. Some also offer hunting opportunities for other species, but the bobwhite is the premier species on most shooting preserves. And the good thing about preserves is that you're assured of having a few birds to take home for the pot. ⊠

Mae's Quail Recipes

Mae Spicer, of Old Spicer Farm Shooting Preserve near Kenansville, admonishes that "nothing should detract from the game itself."

Southern Country Style Quail

6 quail
½ cup buttermilk
salt and pepper to taste
3-4 tablespoons flour
2 cups chicken broth (1 can)

Dip quail in buttermilk; salt and pepper to taste. Dredge in flour. Brown in heavy skillet or Dutch oven. Add chicken broth. Cover and cook on moderate heat 25-30 minutes or until tender.

Serve with rice, hot biscuits, green vegetable or salad.

Gourmet Variations: Add the juice of a lemon, mushrooms, ½ cup sherry, ½ cup sour cream or chopped fresh parsley.

Quail in White Wine

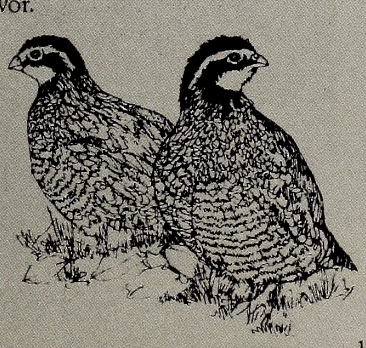
Sauté prepared quail in margarine or butter until lightly browned. Add enough white wine to half cover them. Cover and simmer until tender in a heavy iron skillet with a tight, self-basting lid.

Stuffed Quail

Salt and pepper quail. Stuff with poultry or homemade dressing. Place in a browning bag and bake in moderate oven (350°) 30-40 minutes or until tender.

Serve with wild rice and green vegetable or salad. If a browning bag is not used, place a strip of bacon over the quail.

Mae Spicer said, "My family used to keep a string of quail on the back porch, drawn but with the feathers still left on. Hanging the wild birds in a cool place to season seemed to improve their flavor."



The BARNEY Years

written and photographed by John Rucker ©1991

In my life there was a time that began with the acquisition, and closed 14 years later with the death, of a dog named Barney.

I think of this period as "the Barney years," for it encompassed my coming of age in two places I had dreamed of ever since I had discovered them in the hardback books of my father's library when I was an adolescent. I had headed west after graduation from Chapel Hill, knowing only that I would choose from among Montana, Idaho and Wyoming, to have my fair share of life's bounty. There was no friend, no family, no eccentric uncle waiting there. There was much to be learned. I learned, for example, that in the West most men have a partner. To me a partner had been a member of the opposite sex at a dance, but in the western vernacular it is one's most trusted friend. I also learned that a reticent southerner who owned no ranch or property was taken very lightly in my new home, so my partner in Montana, and later in Alaska, came to be a very independent springer spaniel.

"Each May we began an odyssey of truly epic proportion, back to the world at the other end."

He is gone now, nearly 20 years later, and another dog lies at my feet as I write these words. The new dog is quicker to learn than Barney ever was, and I suspect he has an even better nose for game birds. He is certainly easier to handle, but there can never again be the Barney years in my life, for such a time occurs only once for an individual.

In his later years C.M. Russell did a painting entitled "When I was a kid in Montana." It shows a youthful Charlie Russell riding out of the Judith Mountains, trailing a string of packhorses loaded with beaver pelts. I, too, would come to realize that to have been young and idealistic in good country with a dependable partner was a privilege of the highest order.

The Barney years began in 1974, when I bought him for $75 in Great Falls, Montana. I was working for

a rancher who had a small cattle ranch in the Big Hole Valley nearly within sight of the Big Hole National Battlefield, where Chief Joseph's band of Nez Percé was attacked by the U.S. Cavalry. The rancher, Lester, had another small ranch in Dillon, in the valley of the Beaverhead River, where he farmed. I remember driving, at night, across the sagebrush flats of Horse Prairie with no headlights. There was only the snow, the sage, the moon and Barney the sentinel, watching for white jackrabbits.

In the summer there was irrigating to be done, and Barney and I walked through the flooded hay fields to divert water from the North Fork of the Big Hole River into each meadow. Shadows of brook trout and grayling darted across the dappled gravel bottoms of the pools. The "brookie" was the same trout called "the poet's trout" in North Carolina's most remote streams. There, I had snuck up on each pool as if it contained the rarest, most ethereal of things, armed with a fly rod and short leader.

In Montana, the limit was 10 pounds of cleaned brookies a day, not to mention the graylings and whitefish. The rivers and creeks of the Big Hole country were alive with them, down to the tiniest tributaries, which I could step across. The same fish I had caught and handled as gently and reverently as butterfly wings I now derricked out by the hundreds each summer, using both worms and flies. I would swing them overhead into the grass, where Barney the puppy would pin them under his paws and proudly hold one gently in his jaws until I sailed the next one over his head into the grass. I cooked them like bacon in the bunkhouse and we ate them together, mine from a plate on the table and Barney's from a newspaper on the floor. I was wild to catch big trout and many trout, for this was before the days of catch-and-release fishing. I used egg sacs and sculpins, as well as flies. Having learned to pounce on the little brookies, Barney became a passionate fisherman of all species and would watch each cast intently.

There were days when Lester and I dehorned cattle. We wore yellow rain slickers, which would become as artistically splattered and slung with blood from "spurters" as a canvas of modern art when the dehorning knife did its work. There were moments of bloody death at slaughter time, followed randomly by others of breathtaking beauty and still others of aching loneliness. It was a life which gave a sense of proportion. It served to leaven the excesses of the human ego and its vanity. Looking back, I realize these moments, which seem so rich and poignant and full of wisdom and out of reach now, were once the province of every one of us, when Man looked to Nature and the Earth, rather than to money, for his identity and security.

In the winter there were periods when the road into Lester's ranch was drifted in for weeks before the snowplow cleared it. Barney and I ate a lot of deer meat and potatoes. For heat there was a wood stove that would burn out while we slept. In the mornings it would often be 20 degrees below zero in the cabin and my quilts, as well as Barney, curled up at the foot of the bed, would be covered with frost.

One frigid afternoon, I fished for whitefish in one of the few open pools on the North Fork of the Big Hole River with a wet fly and a maggot as Barney watched at my side. Suddenly the ice shelf which I stood on broke under me and I fell into 20 feet of water wearing chest waders and a heavy, hooded goose down coat. As I sank far below the surface into the electric blue cold, I opened my eyes to see fist-sized chunks of ice moving silently past my face in slow motion. I broke through the surface and heaved my arms over the shelf of ice, and my hair instantly was transformed into a crown of ice. I could feel the strength being quickly sucked out of my body. I knew I would soon weaken and slip under the surface and join the ice balls that slid silently underneath the shelf of river ice. Barney hesitantly walked up to me, eyeball to eyeball, and licked my face. The warmth and smell of his doggy breath snapped me out of the seductive lethargy of death into which I was slipping. Having just found paradise, I was not ready to die. I began to kick and claw and flounder. I got my armpits over the edge of the ice, then my chest. I beat the water with my legs, and I heaved my chest onto the ice, noticing I still held the fly rod in my hand. I flung it away in horror. It was an ice-sheathed scepter of death. I tore my water-filled chest waders off and ran barefooted through the crusted snow, willow branches whipping me across the face, terror riding on my back. I ran a quarter of a mile back to the bunkhouse, with Barney galloping at my side, and huddled at the wood stove until I was warm.

"After school Barney and I walked some of the finest country on earth, the rolling short-grass prairie, in search of birds.

One afternoon while we were in North Dakota, my years with Barney nearly ended prematurely. As he ran down a pheasant trail through the cattails, I heard a metallic "clank" followed by a quick bark of surprise. Then there was silence. I ran to see him lying on his side with a Conibear trap shut tight around his neck, his eyes bulged out and his jaws biting the air trying to breath. My mouth dry with terror, I tried to pull the jaws of the trap open, but they were too powerful. The 15-year-old boy with whom I was hunting had a cooler head than I did. After I had exhausted myself on the trap, I turned to him, my mouth so dry I could hardly speak, hands shaking terribly. Barney had

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been without air for nearly a minute and was well on his way to death. Young James Butler of Mott, North Dakota, swiftly took off his belt and made a noose, into which he put one foot. He then looped the belt around one of the springs and was able to depress it by cinching down with the belt. I slid the steel keeper over one spring. He quickly depressed the other spring the same way and we lifted the Conibear over Barney's head.

There was a series of agonizing, retching inhalations as Barney locked horns with death and, with his valiant heart, prevailed. I watched as his spirit seemed to flow back into the body, which one moment looked so pitiably small and broken and the next was restored to Barney of the lion's heart. He quickly stood and shook mightily, long and hard, as if to rid himself for-

"Occasionally at night a ptarmigan would fly through the yellow glow of the street light in a swirl of snow flakes."

ever of the evil thing that had nearly killed him. It had been set for beaver or raccoon and would have broken the spine of a dog without Barney's thickly muscled and deeply furred neck. We resumed our hunt. Another dog might have slunk at his master's side for the rest of the afternoon; not Barney. At once he was hunting as passionately as before, hurtling down pheasant runways, seeking the golden scent.

The life of a bachelor ranch hand in the Big Hole Valley is a lonely one, and after two years Barney and I moved to central Montana, in the heart of bird country, where I took a teaching job. The mid-1970s was a wonderful time on the northern plains. The numbers of mallards, pheasants, sharp-tailed grouse and Hungarian partridges were all at carrying capacity. Each day after school Barney and I walked some of the finest country on earth, the rolling short-grass prairie, in search of birds. I suppose for the next two years Barney and I had it all, birds for the taking, fly fishing on a nearby spring creek in Lewistown and on the Musselshell River near Harlowtown. I could have stayed forever, but Alaska was pulling me like the sirens of Lorelei Rock. When I signed the teaching contract and mailed it back to Alaska, I knew my life would never be the same. Barney and I left the next summer, trailing a plume of dust along the Alaska highway, with nearly every possession I owned packed in my Volkswagen bus. Barney rode shotgun in the passenger's seat.

Driving into Anchorage ended any illusions I had about Alaska. It could have been St. Louis or Seattle or any big, dirty, rude city. There was pollution. There were seedy hotels and drunks and winos as well as fantastically high prices. The credo among the people seemed to be "Win at any cost." I pined for my courtly southerners. I stored the van, put Barney in his air kennel and flew to Bethel, where things went from bad to worse.

The year of teaching in Bethel was a long one. The winter quickly closed in and a succession of endless nights began. It was dark when I walked to the high school and dark when I walked home at 4 o'clock in the afternoon. Many of the other teachers had come for the obvious reason — money. They put money down on condominiums in the lower 48 states, planned Christmas trips to Hawaii and talked weekly to their stockbrokers by phone. But for Barney and me, the winter was a time to pay in advance for the long hours of sunlight we would reap next summer. I dreamed of Montana and Saskatchewan, a season of external sunny September existed in my mind. It was the loneliest winter of my life, more isolated than even the Big Hole winters. I didn't know where home was anymore or where I fit into the scheme of things.

Sometimes the temperature, including the wind chill, would drop to 100 degrees below zero. You walked with your nose in your mittened hand so you wouldn't freeze the end of it. Ice storms would coat the wooden boardwalks. Without ice creepers on your shoes, you practically had to crawl on all fours. Occasionally at night a ptarmigan, a grouse-like bird, would fly through the yellow glow of the streetlight in a swirl of snowflakes. "There is a world of nature out there, frozen but unspoiled," I told myself. "I must hold on until spring."

Barney got me through that winter, pure and simple. I bored him with endless conversations as the wind shook the foundation of the little house I rented. Barney slept on the bed with me because the floor was too cold and drafty. He was gloriously warm, familiar and reassuring. On weekends we hunted ptarmigan within walking distance of the high school. There were no roads except those within the town of Bethel, population 4,000, the hub of southwest Alaska. If nothing else, that winter taught me to respect the Eskimo people, who had survived those dumbfounding winters since time out of mind.

At that time the Eskimo students came from all over the delta of the Kuskokwim River. They boarded at the regional high school dormitory. While the local natives were as materialistic and ambitious as the white teachers and administrators, those from the outlying villages were as quiet and observant as mink. They fascinated me. I asked them endlessly about their villages. The names of them were as musical as the cries of lesser Canadian geese returning to the tundra in spring. Mekoryuk, Tununak, Kipnuk, Kwigilligok and Kongiginok. At the school assemblies, the village kids wore fur parkas of otter, seal, beaver, muskrat and weasel, trimmed with wolverine or black bear, hand sewn by their mothers. They often carried their little

baby cousins in their arms. Their smiles flashed as they licked candy from the faces of their tiny charges. I told myself, "What I want is out there, but I have to leave the population centers, where money is God, to find the real riches."

By the time the willows were putting out their furry silver buds I knew to which village I would go to gillnet salmon. I wanted to go as far from Bethel as possible, and yet still stay within the commercial fishing district of the permit that I had bought over the winter. There was a small village named Melancholy Bay with an excellent fly fishing river and a large bay, surrounded by hills and mountains. There were no white commercial fishermen. Each summer in Melancholy Bay salmon were bought by a floating processor or were flown out by a DC-3.

Over the winter I bought a 26-foot boat with a small cabin and a 16-foot skiff for going upriver. As spring lengthened, the river ice began to grow dark and vocal. The cars, trucks, planes on skis and wheels, snow machines and dog teams no longer used it like a highway. Suddenly, during a 24-hour period, the ice broke up and moved out. There was the tinkle of running water everywhere. The Bethel people put their boats in the river and began to take short trips on the mighty Kuskokwim, which in Alaska is second in size only to the Yukon River.

I knew little of boats or outboard engines, of winds and tides; I did not even know that, of the two incoming tides each 24 hours, one was small and one was large. I tried to find other, more experienced watermen heading downriver for the coast, but I learned that only the Eskimos of the villages at the river's mouth go there without trepidation. The white boatmen cross the Kuskokwim's mouth, wider than the Yukon's, in flotillas with a leader who has made the trip many times before. I heard over and over that it was very dangerous country for the inexperienced. Unable to find a traveling partner, I decided to make the trip downriver 60 miles to the mouth alone, cross the mud flats and go down the coast another 70 miles to the village I had chosen. It looked so wonderfully simple on the map. Looking back, I'm glad I made the trip alone, for it was my true initiation, my rite of passage, from the unreal Alaska to the real.

One afternoon in early June, after many of the other teachers and administrators had left the state for the summer, Barney and I watched Bethel disappear around a bend in the river. So heavily were we loaded that the pair of little 35-horse outboards pushed us along at about 8 miles an hour, towing the 16-foot skiff behind. As the Eskimo villages along the river slid by one by one, the Kuskokwim grew and grew. Barney and I spent the first night anchored near the village of Tuntuliak. I felt I was finally coming into Alaska. The next day there were no more villages to watch for on the map and the river had grown so wide that in places I could not see across it.

At this point the river began to behave strangely. How could a river carry you serenely on her back in the morning, as wide as you could see, and in the afternoon vanish entirely, becoming an endless mud flat with a maze of channels and false channels meandering randomly into the gray horizon? At mid-morning on the second day I found myself stranded in the middle of the river on a sandbar, miles from either shoreline. The main channel, which I had lost, was clearly visible at low tide. It ran several hundred yards east of me. I consulted the tide book and learned that the next tide would come that night about 7 o'clock. Barney and I walked along the bar, watching the shorebirds that picked and probed the aromatic mud flats. We were careful not to go too far from the boat. There were only Barney and I and the clouds and the flocks of tittering dunlins and sandpipers.

An Eskimo in a homemade plywood skiff appeared as if by magic, popping up two rifle shots away on the horizon, threading the endless mud flats unerringly through the channels that had tricked me. He stopped opposite my boat, hoping it was abandoned. His wife and two children huddled in the front of the skiff under a tarp on a wooden frame. I yearned pathetically for visitors. When he saw Barney and me he sped away in disgust. In moments he was a moving speck that was swallowed up by the heroically empty mud flats. The sense of desolation was overpowering. The horizon was so broad and monotonous that it seemed to swell with the curvature of the earth. There was no living creature except for the occasional flocks of black brant, cormorants and eider that boiled up on the horizon, moving with ridiculous slowness across the vastness.

At around 5 o'clock the tide began to trickle onto the sandy bar where we waited. I watched it slowly filling the depressions and intricate vermiculations in the sand. It began to flow quickly along the shoulders of the bar moving upriver. We walked quickly across the hundred yards of sand that separated us from the boat. It was easy to beat the incoming tide, which moved at a snail's pace. We waited on the boat to be floated free so we could motor over to the channel and resume our trip, but the river had a cruel trick in store for us. The water barely touched the hull at around 7 o'clock and then began to recede, leaving me high, dry and crushed. I would have to wait out there in the center of one of the wildest river mouths in the state of Alaska. There would be another 12-hour wait until the next tide. Every minute of good weather at the

"The village kids wore fur parkas of otter, seal, beaver, muskrat and weasel, trimmed with wolverine or black bear, hand sewn by their mothers."

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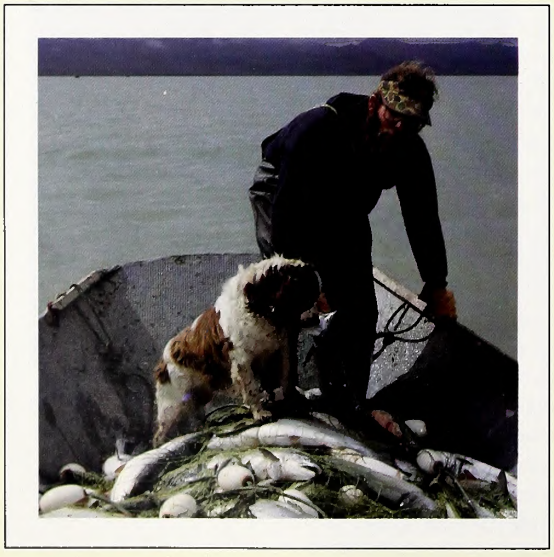
river's mouth is borrowed; bad weather is never far away. I watched the horizon nervously.

We were up early the next morning at about 3 a.m., for it was already light enough to see, had a few pilot bread crackers for breakfast and resumed our nervous walking up and down the bar that snaked forever toward the gray horizon where the ocean waited for us. We walked until the boat was nearly a mile away, a white speck on the mud flats. I assumed the next tide would move at the same snail's pace as the previous one. At 4 a.m. a wind began to blow as if by magic. It was my first experience with the "high tide wind." I stood there enjoying it until the strength of it started to scare me. I noticed the water was already lapping at my feet. I looked back at the boat and saw to my horror that parts of the bar between the boat and me were already under water. If I had known the significance of the symbols in the tide book, I would have known that I was seeing the tidal bore of a 6-foot vertical high tide. My mouth went dry in an instant and I began to sprint over the sand, with Barney loping at my side. In less than 50 yards we were splashing through water up to our ankles and halfway to my knees in low places. The boat remained tiny in the distance. Soon Barney was galloping at my side in foaming salt water up to his chest, trying to stay up with me. The mud flats were gone and Barney and I plowed ahead agonizing minute after minute as the bubbling tide head surged past and the wind blew. Both my boats were riding at anchor, and Barney was swimming at my side in water over knee-deep when I heaved him over the side and then fell in myself, to lie there on the deck cursing my stupidity. It would not be the last time. I started the engines and headed for the closest shoreline, which was a black line of willows on the horizon. The end of the bar where Barney and I had been walking 30 minutes before was lost under angry, short-troughed waves.



"There were times, I'm sure, when Barney thought we would both end up on the bottom of the bay to have our bones picked clean by the crabs."

We slid along the west coast of the river all that day, coming closer to the actual mouth, which was two miles across. That afternoon I anchored near Helmick's Point, terribly vulnerable to a sudden storm, to wait for the next day's incoming tide to cross the shoals and mud flats at the river's mouth. That night, we were rudely awakened to find the tide had gone out again, leaving us high and dry but resting crazily on several truck-sized pieces of tundra. The next morning the boat floated free, but only after I had moved the engines into the fish bins at the bow to keep them from being submerged before the big boat's buoyancy popped it free.

After two sleepless nights, we crossed the river mouth, using the Kilbuck Mountains in the distance to steer by as missionaries and traders and explorers had done before us. We followed the coastline all that day, entering the clear, frigid waters of the Bering Sea, where the air took on an entirely different smell.

After 15 more hours, we slipped humbly inside the mouth of Melancholy Bay. The body of clear, blue, silt-free water stretched before me in splendid isolation, protected from the ravages of the 20th century by a ring of hills and mountains. Barney and I would spend nearly six months out of each of the next six years in this 13-mile-long bay, a tiny world within a world. We would place our names on the ledger of those both oriental and occidental who had entered this little-noticed nook on the southwest coastline of Alaska. We would fight the good fight here, both with the gods of nature and the gods within the human heart. It was absolute privilege. We had arrived in Alaska.

The Melancholy River, which fed the bay and brought in the anadromous fish from the ocean, pulled Barney and me to her within a few days of our arrival, as inexorably as the salmon. It was a dream river that still runs through my subconscious as the archetypal river, the flowing symbol of the fertility of the earth, filled with legions in from the sea, her gravel bars black with the backs of arctic char, sockeye salmon, and torpedo-sized king salmon. Years later I pine for it, and for the exhilaration of standing at last at the rainbow's end and gazing upon this holy grail of rivers. The search for it had carried me nearly 10,000 miles, a quest of nearly religious fervor and conviction.

In those days there was only one commercial guide service on the river and its operations were limited to the North Fork. The sandbars of the Middle Fork and the South Fork were free of boot tracks and her pools and riffles innocent. Barney and I shared the river with the few Eskimos of the village who still maintained upriver fish camps. They would come by with wives and children and grandparents crowded in the fronts of their skiffs. Their waving hands, flashing smiles and black hair would remain in my mind's eye long after the sounds of their outboard motors had faded in the distance. They thought it hilarious that the new *gussak* and his fish-retrieving dog could find it so diverting to catch the rainbows and char one after another, only to throw them back into the river.

During the commercial gillnetting periods, my frequent miscalculations and mistakes were greatly enjoyed and appreciated by the village fishermen. I would learn that the phenomenon of *schadenfreude*, or taking delight in the misery of others, was as much a part of their culture as my own. Now it is the memory of the struggle of the first summers that I

recall warmly, for had the way been made easy by others, the success would not have been nearly so sweet. The Eskimo and I shared a feeling that, yes, it is a puzzle, and when you have put all the pieces in place and there is no more mystery, life is over. It was my unspoken pact with them.

I also learned that the Eskimo have a word in their language that has the same meaning as "partner" in Montana. My uncomplaining *eluk* was Barney, through the lonely summers of tent living and apprenticeship on the bay.

There were times, I'm sure, when Barney thought we would both end up on the bottom of the bay to have our bones picked clean by the crabs. One stormy May as snow still covered much of the tundra, I fished for herring alongside the village fishermen in their homemade plywood skiffs. After several days of fishing, as I prepared to deliver a load of herring to the processing shop that lay at anchor in the deepest part of the bay, I noticed that none of the other fishermen were heading out to deliver, ever since a stiff wind had sprung up out of the southeast. I would not be deterred, however, and besides, it was not blowing very hard on the sheltered shoreline where our herring nets were anchored and buoyed. When I reached the unprotected water, I was suddenly surrounded by hissing seas with white heads, but since it was shorter to go the last two miles to the ship and deliver than to turn back still loaded with herring, I continued into ever-rougher water.

As I pulled alongside to tie off to the 150-foot vessel, my boat was rising and falling 8 feet with each wave and trough that followed the steel flank of the ship. As I slid to the bottom of a particularly deep trough, the tie-off rope tore away the bow railings on the starboard side of the boat, then did the same on the stern, just as I finished vacuuming the last 100 pounds of herring up the wet hose that the crew had dropped down to me. I yelled up to them over the howling wind that I would be back later to pick up my ticket and payment. A crewman screamed down to me, "It's blowing 50 miles per hour." I headed toward the protected shore four miles away, standing at the front steering station, sliding over crests and down into troughs. The steering cable snapped when I was a half mile from the ship and I turned sideways and took in a wave before I could scramble to the rear to steer with the second engine. I started it, and while desperately turning the nose into the seas before another wave could come in over the side, I snapped off the tiller arm on the second engine. I dropped to my knees and grabbed the engine powerhead in my arms like a lover and muscled the engine around to correct the yaw a moment before a wave slammed into the quartering bow. I baled furiously with my garbage pail, standing up briefly from my kneeling position to look over the roof of the cabin to make sure I was heading in the right direction and was nose first into the waves. I operated the throttle by reaching under the engine cover — since the throttle controls were on the tiller arm. The back door of the cabin came unlatched and blew open and was instantly ripped from its hinges. It flew past my face, inches from my nose, and skimmed over the foamy waves like a flung stone. Inside, I could see Barney curled up in a tight ball, the whites of his eyes showing as he watched me with his head buried in his paws. The waves crashed over the cabin and onto my back. I baled like a madman, occasionally pausing to curse the heavens and my own stupidity. The look on Barney's face told me I must look like the devil himself, bailing and cursing, dressed in yellow rain gear. We made it back to the sheltered shoreline, dropped anchor, climbed into the skiff and rowed to the beach. As I went into my canvas tent to try to forget the morning, one of the village fishermen stuck his head out of his tent and said, "Rough, huh!" and grinned.

There were other days when I saw the whites of Barney's eyes. One slow day as I sat on a fish bin in the bow, alternately nodding off and watching for an occasional salmon to hit the gill net, I smelled fire. I looked back to see the boat cabin full of smoke. I hopped over the fish bins and opened the door to see

"They thought it hilarious that the new gussak and his fish-retrieving dog could find it so diverting to catch the rainbows, only to throw them back."

that my foam flotation coat had rolled onto the cookstove. Barney sat with his back turned toward this new calamity, as if not looking at it might make it go away. The expression on his face as he faced the wall, watching out of the corner of his eye, was so utterly human that I could not help but laugh as I inspected the expensive and ruined coat.

Barney always knew that, no matter what happened, his lord and master would be there to make it all right. On calm, windless days when the mosquitos would make life miserable for Barney, he would sit and stare up at me until I noticed that his eyebrows and the base of his nose were under attack. I would wipe away the busily sucking fiends and work insect repellent into my fingers and then rub it into the fur around the hot spots that the mosquitos invariably sought. When I finished, he would shake mightily to show how he hated the smell of Cutter's Repellent. Yet he knew that it was better than no protection. In Barney's later years it was though he had come to understand, much on the same level as a human, that life seldom offers any perfect solutions. Perhaps because of this perspective, Barney was always regarded as an equal by those of us who knew him.

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As the summers slipped by, I came to enjoy sharing the fishing with the new "greenhorn" teachers that arrived each August. Often I would carry three or four of them upriver at a time, and we would spend an afternoon casting into a pool of arctic char and silver salmon. Barney would run to whoever had an arced rod and a splashing fish, retrieving and then dropping it unceremoniously on the gravel bar. He would then stand poised, without a backward glance at that fish, waiting to race to the side of the next angler to connect.

For the first hour, I would hear remarks like, "Isn't he cute?" or "I wish I had a camera." Four hours later, when everyone was sated from casting and reeling in char and a pile of them over a hundred deep lay on the gravel bar, Barney was still there, poised like a lion ready to wade chest deep into the icy river and close his jaws gently and unerringly around the girth of another sea-fresh char. There was no longer any comment on his curious passion for fishing. There was only a silent consensus of respect for a fisherman who was as driven as any one of us, and we knew that when it came to heart, Barney was as good as any of us.

"Barney became a passionate fisherman of all species, and would watch each cast intently."

After a long day of fishing, I would hear his groans late into the night in the tent. He had arthritis in his hips after he was nine years old, from years of fish-retrieving in the icy water. His eyes were becoming milky and many of his teeth had been knocked out in dogfights. I would look into his face, remembering him as a puppy, grown to be Barney of the lion's heart in this place so far from Montana's prairies. He was admired by bush pilots and commercial fishermen and Fish and Game officers. Barney moved among them as an equal. One spring as I worked my herring nets, Dee Johnroe, well known across the Kuskokwim Delta as a perennial contender in the Iditarod Sled Dog Race, pulled alongside to tell me the herring season would close that afternoon. I asked her how she knew my name. "I know you by Barney. Everyone at the Bethel Fish and Game office knows who Barney is."

During the early Barney years, I had no home. I was driven by the search for "the moment," in the sense of fishing for excitement, for beauty, for the opportunity to test myself, for the moments that reveal glimpses of the essential truth of our existence. The feeling of homelessness is the same as the feeling of loneliness. I am convinced that continued homelessness and unconnectedness is ultimately fatal. In 1979 tragedy struck my family back in North Carolina. My mother died, and my father began to fail almost immediately. I began to spend much of the year in North Carolina. At first I felt I was giving up the things that made life worth living, the good fishing and hunting, but by the mid-1980s North Carolina was home again.

As for Barney, North Carolina must have been a place of dazzling sensuousness. In the evenings in early spring, I would watch him when he was tied in the shade in the front yard, where he could surveil my van to ensure that he was not left behind on any outing. He would stare into the splendid hardwood trees in my father's front yard, listening to the jar flies and katydids as they droned in the leafy canopy high overhead. He would watch incredulously as lightning bugs blinked off and on in the twilight. I think he knew that it was my father who spoke softly to him, and that all was not right with him, and that our purpose there was connected with him. He also knew that there were three worlds after 1979. The new one was where he sat at the feet of my father and me on the porch with much conversation and laughter.

Each May we began an odyssey of truly epic proportion, back to the world at the other end. Barney and I would drive from North Carolina to Montana, fly fish for a week, continue to Seattle, where the van was stored, then fly to Alaska for the commercial fishing season, which usually lasted four months. That was the world of rain, loneliness, little laughter, grim challenges, living in the canvas tent, and many, many fish — Melancholy Bay. On his leash, Barney would walk down the steps of the Twin Otter in early May or June, a week before commercial fishing, and smell the Bering Sea air, sled dogs and salmon on the racks. His expression would say, "Oh, we're in the fish world." In October we would drive from Seattle to Montana, the place of Hungarian partridges, pheasants and brook trout — the bird world. Each December found us back in North Carolina. We shared our three worlds until 1987. That was when I learned that Barney had cancer.

An anal gland at the base of his tail had become hard and impacted and was malignant, and I began taking Barney to the North Carolina State University Veterinary School, one of the best in the country, for experimental radiation treatment. Twice a week for eight weeks I drove Barney 100 miles to Raleigh. Barney was put to sleep and irradiated. The fur fell out on his rump. The flesh was red and angry. Usually somewhere between Burlington and Greensboro the anesthesia would wear off and Barney would stir in the front seat. I would wake him with a gentle hand on the top of his head, since he was nearly deaf by then, at the age of 13½. The stub of a tail would wag three times, no more, when he realized he was with me again.

Barney's treatment was concluded in late October. There was only time to fly to North Dakota for

a 10-day bird hunt. The treatment may have helped give Barney strength for that last trip. I will never know, but I do not feel it was worth the torture that he uncomplainingly endured. He hunted passionately. His eyes glowed that last fall, questing for the golden scent, the moment of the flush, the pop of the gun, the bearing of the prize back to his lord and master. I dreaded the last day, for I knew what Barney could not know, that there would never be another autumn for him. I dreaded the last bird, sliding the gun in the case for the last time, and cleaning the last grouse and throwing Barney the heart and liver, smoking in the cold, to eat.

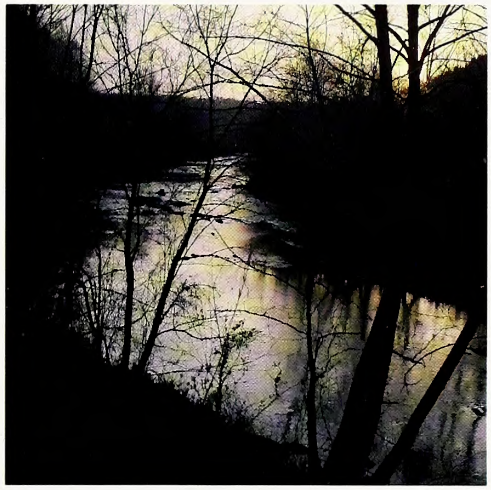
That last day before the flight out of Bismarck, we hunted sharp-tailed grouse. At day's end we were in a deep coulee where very cold air had settled. Barney's breath came out in white puffs. At sundown he ran ahead and flushed a flock of grouse, slightly out of range. He sat down and waited for me. The look on his face said, "I got a little ahead of the gun." He was slightly embarrassed, utterly human. I decided to walk back to the rental station wagon with the memory of Barney's expression as my ending. At the top of the coulee, a flock of sharp-tails, on their way to roost, flew directly overhead. I killed one bird and Barney bounded to it, his red rump and naked tail wagging furiously. He brought it to me with his head held high, eyes blazing. I took the bird from him and sat in the dried brown grass and cried. He watched me gravely, the prairie wind ruffling his fur.

As the year turned over and 1988 began, Barney had difficulty passing stools. A tumor inside his abdomen was gradually blocking off his small intestine. There was nothing to be done. One Sunday I had no inclination to leave the house. I lay in bed and read and Barney, who usually preferred to have his own space, joined me on the bed. We visited amiably, my hand on his head, as I read. That night, around midnight, he woke me up with cries of pain. When I picked him up, he cried like a child, looking frantically into my eyes. I took him to an emergency vet clinic, where he was sedated. The next morning Barney's vet told me his time was up. I sat on the floor in the back room for hours stroking him where he lay in the kennel. He would doze off and then lift his head and look at me and then put his head down again, reassured. Finally, when it was after closing hours there was nothing left to do. I would hold Barney in my arms as the shot was given. Barney and I would see this last thing through to the end, together, for Barney never had any patience with faintheartedness. As Barney dozed in my arms, I gazed at him one last time and images which spanned a continent flashed by. When I saw Barney was in deep sleep I nodded my head. He would never wake from this last dream. But when the serum hit his bloodstream, he jerked his head erect, pulling it from my arms, and he bit me on the hand, eyes crying out, "Damn you, I wasn't ready!" His eyes locked with mine. He died with my hand held as firmly as a grouse in his jaws, yet careful not to hurt me even in his very last moment of life. In his last split second of life, had he felt betrayed by me, in that instant when he felt his death? My grief was heightened by a sense of horror over what I had done. I had let the 5 o'clock closing hour influence my decision. After all the years he had given me everything his strong heart could give, he might have slept soundly that night at home with me. Barney had had the last word. I knew that I would hold the image of those accusing eyes in my memory until my last day on this earth.

I feel that burying Barney in the South was appropriate, for really all he had ever known was a southern personality, mine. The morning after Barney was put to sleep, Joy, Dad, Jimmy Holt, my last helper at Melancholy Bay, a fly fishing companion, Everette Daughtridge, and I all drove to Virginia's Smith River, an hour north of Greensboro. I wrapped Barney in a blanket and put him into my large backpack. We all walked along the river to the pool where Barney and I had spent so many hours fly fishing during the last six years.

There is a quarter acre of flat ground overlooking a section of the river where Barney and I had eaten many a can of cold beans for lunch. It is on the far side of the river, and I had to put Dad's waders on for him, for his Alzheimer's disease was so advanced that he could not do it alone. Dad walked across the river holding onto my arm, Barney in my backpack. It seemed impossible that Barney was not plowing resolutely through the current before me, as he had done for so long. At the graveside I quoted a little dog poem that I had found years ago in Dad's handwriting on the back cover of a copy of the Georgia-Florida Field Trial Book, with the initials "BCB." "Oh God, my master, should I gain the grace to see thee face to face when life is ended, grant that a little dog who pretended that I was God, might see me face to face." Dad and I cried silently together. It was the last strong emotion we two would ever share. ⊠

"I wrapped Barney in a blanket and put him in my large backpack."



John Rucker lives in Greensboro, but still travels. This article is part of a book, The Barney Years, *which is in progress. He is also the author of* Melancholy Bay, *a book about his years in Alaska.*

Cataloging Critters

How do you inventory all of the hundreds of possible species of wildlife on 300,000 acres of game lands? And why?

written by Allan Boynton
photographed by Ken Taylor

"Hey, come look at this!" I heard Ken Taylor shout. I shone my light towards the mist net that we had set out on the hill.

"What in the world is that?" I shouted as I left the net I was tending and hurried upslope. There in the net, looking bewildered, was a southern flying squirrel. I thought that it would tear the fine strands of the mist net, but it was not tangled badly. Ken reached up to get it and it came right out of the net onto his arm, looked at us a minute, and leaped to the big pine that stood by one end of the net. It hightailed it up the trunk and pretty soon we could hear several squirrels in the darkness above us.

That was but one of the surprises we were to encounter that evening and others. Setting such nets has become a routine part of my job as mountain project leader for the N.C. Wildlife Resources Commission's nongame and endangered species program. Ken was on hand to help while shooting photos as chief photographer for the agency. Earlier, just before dark, we had set the mist nets up on Thurmond Chatham Game Land. Our intended quarry was bats. The night before, we had caught two of the eight species of bats that might possibly occur in the area. Both the red bat and the hoary bat had flown into the almost invisible nets as they pursued insects.

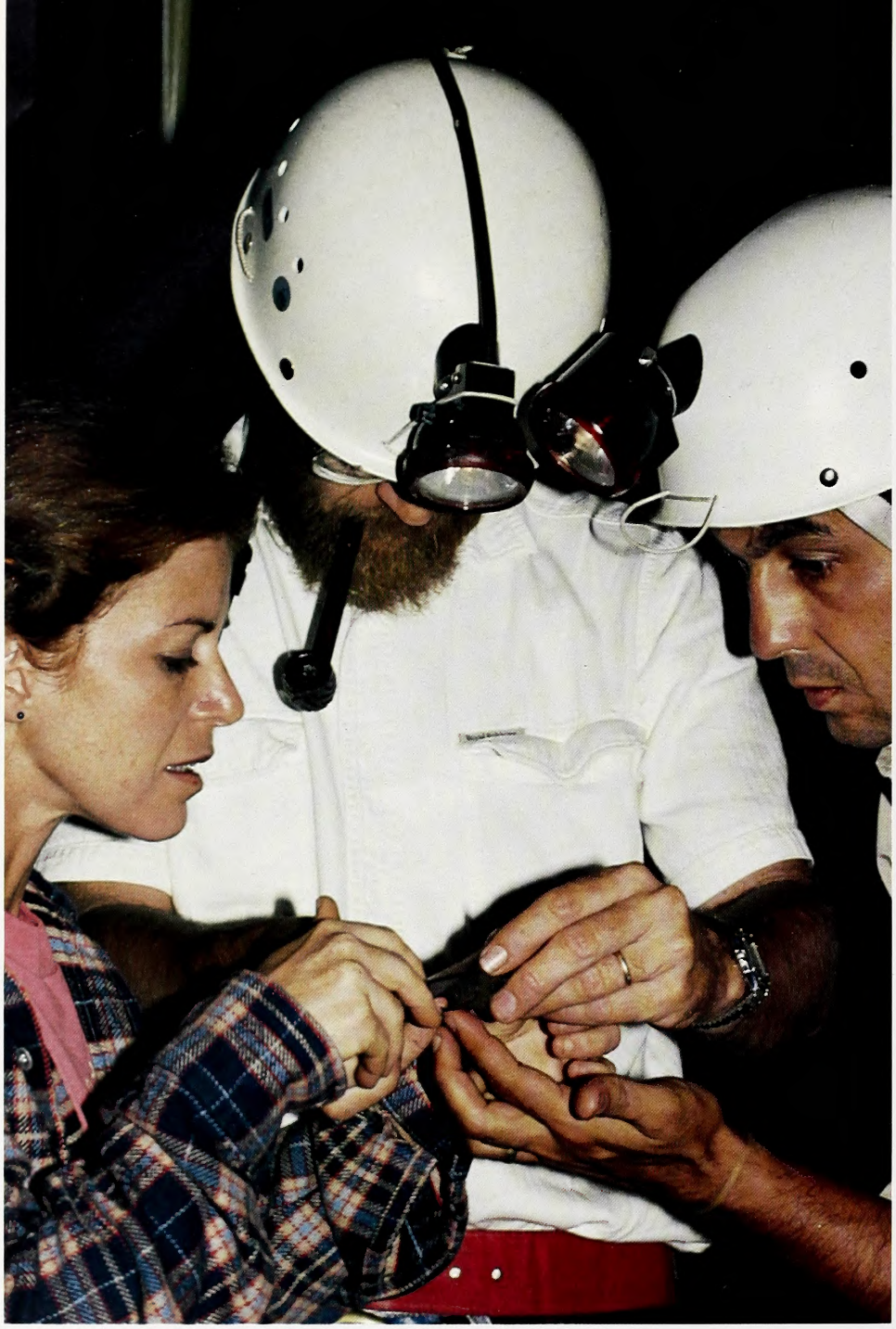
We were taking part in a five-year effort to catalog vertebrate species that occur on two state-owned game lands managed by the Wildlife Commission in western North Carolina. Thurmond Chatham Game Land in northern Wilkes County and Green River Game Land, on the Polk-Henderson county line, are familiar to many residents of the state's foothills region. Most folks, however, would be surprised to learn just how many different types of wildlife live on the two game lands.

In addition to managing wildlife on National Forest or private lands, the Wildlife Commission manages almost 300,000 acres of game lands it owns in the state. Much of this work has to do with property maintenance: the care of roads and bridges, boundary lines and such things. The agency also carries out management projects to favor wildlife species that have high public interest, such as game species or endangered species.

Green River and Thurmond Chatham game lands have felt the full weight of centuries of human occupation. Both areas were farmed and timbered prior to their purchase by the state in the 1950s. A fire severely damaged natural resources, particularly soils, on Thurmond Chatham during the 1940s, while farm practices caused significant erosion of sensitive soils on Green River Game Land. The Commission has managed these game lands to restore and protect their biological resources.

A wildlife inventory of all creatures — not just those hunted or favored by wildlife observers — provides important information to a landowner wishing to include wildlife in land management plans. One reason such a wildlife inventory is useful is that some types of wildlife are more exacting in their habitat requirements and, therefore, more sensitive to environmental change than others. For

***Wildlife Commission biologist** Alan Boynton (left) examines crevices in rock formations on the Green River Game Land for endangered salamander species. These rock formations harbor many salamanders (above). This work is part of a five-year effort to count the vertebrate species in two state-owned mountain game lands.*



The Wildlife Commission, *which protects state-listed endangered species, and the U.S. Fish and Wildlife Service, which protects federally listed species, often cooperate on surveys. Here U.S. Fish and Wildlife Service biologists Nora Murdock and Bob Currie (left and center) study a red bat with Wildlife Commission biologist Alan Boynton.*

example, the Swainson's warbler prefers the impenetrable rhododendron tangles that we curse. These warblers would shun the well-stocked white pine plantation that many landowners might be tempted to install in place of a rhododendron thicket. On the other hand, the white-footed mouse has no such limitations, and it occurs in almost every terrestrial habitat found in the foothills region. One can all too easily eliminate the habitat of some species unnecessarily simply by not knowing of its presence.

Of particular interest to landowners are species that have a poor prospect for continued survival in the state (see lists developed for Thurmond Chatham and Green River). North Carolina has recognized the precarious status of many species recently by listing them as endangered, threatened or of special concern. While every county in the state hosts at least one listed species, only a survey can help determine the presence of these species on any particular tract.

As a first step in our wildlife inventory of Green River and Thurmond Chatham game lands, we itemized the vertebrate species that could possibly occur there. The preliminary list for each area presented the incredible possibility that we might find around 300 vertebrate species. However, many of these species are birds that occur in the areas only during migration. More likely, one might expect to find about 200 species year-round.

Compiling a species list might sound like a simple task, but it gets complicated. Either a biologist with a detailed knowledge of the distribution of the state's approximately 800 vertebrate species is required or hours must be spent poring over numerous texts to retrieve the information oneself.

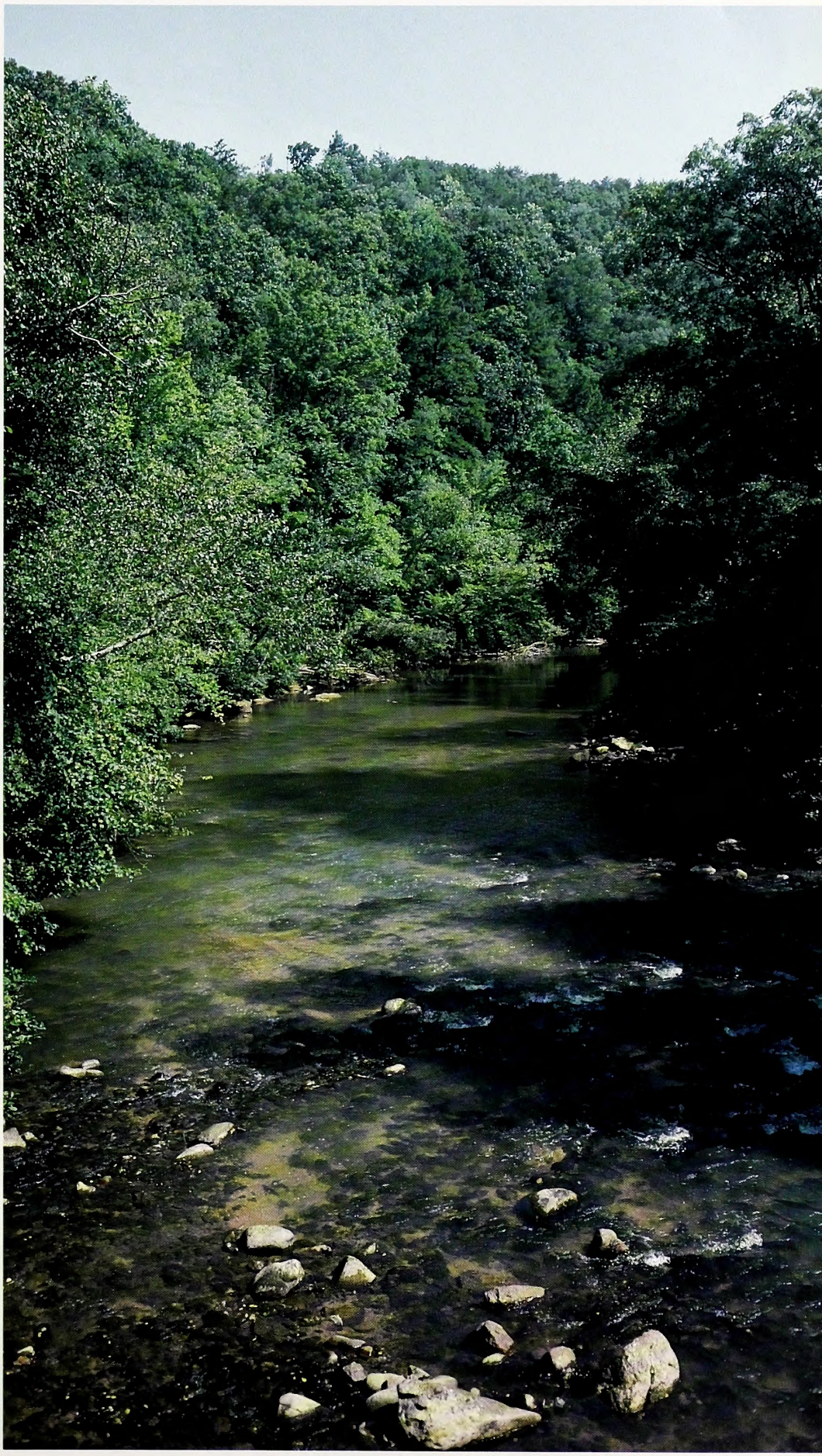
The Wildlife Resources Commission has pooled resources with The Nature Conservancy and the North Carolina Natural Heritage Program to set up a computer database that makes the compilation of species lists easier. The Nature Conservancy designed the data management system and state government added North Carolina information to computer files to allow faster retrieval of data.

Taking an on-site census isn't just a matter of knocking on doors. You have to vary your methods depending upon the species. So far, we've used mist nets to capture bats in our work on Green River and Thurmond Chatham. Scrabbling after salamanders in a brook has also become a familiar task, as well as peering into a rock crevice. As you'd expect, such tactics usually prompt inquiries from bystanders. I have explained to more than one bowhunter why we are trapping mice on game lands.

As you might expect, the more common species are most easily observed; therefore, much of the labor involved in a wildlife inventory is spent looking for the more uncommon specimens. I trapped one field on Green River off and on for two years before catching a meadow jumping mouse. We found six other species of small rodents in this same area: the eastern harvest mouse, golden mouse, white-footed mouse, meadow vole, pine vole and cotton rat. The field is rich bottomland that the Commission manages for grassland and "old-field" habitats.

The staff is two years into this five-year wildlife inventory project, scheduled for completion in 1993. Future work will concentrate on the reptile, amphibian and bird species found on these game lands.

The Commission will be able to use wildlife inventory information in planning how it will manage state-owned game lands in the future. On Green River and Thurmond Chatham game lands, for example, the Commission is already carrying out an active management program to address problems like soil erosion and the need for reforestation. We also have managed the areas to produce populations of wildlife that rank high in public interest. This



***The Green River Game Land** in western North Carolina is rich habitat for many wildlife species. Biologists hope that information from the two game lands will help the Wildlife Commission manage other game lands for a diversity of wildlife species.*

work has involved actions as varied as encouraging the colonization of oaks and yellow poplar stands and cutting vegetation to retain the "old-field" character of recently farmed areas. The goal is to maintain or create diversity of habitat to support as many different species as possible.

As the years go by and North Carolina's human population grows, the habitats that many wildlife species depend upon will become smaller and more scattered. Already, in some cases the best remaining examples of natural communities are on game lands, and these areas often provide habitat for rare species of wildlife.

As wildlife habitat continues to be lost in North Carolina, the Commission's obligation to protect the natural values of the land it manages becomes even more crucial. That means that setting mist nets and scrambling around in creeks to learn what's there and what's not will become more and more important. The inventory information thus gathered is vital if we hope to avoid harming wildlife resources unintentionally while carrying out land management activities.

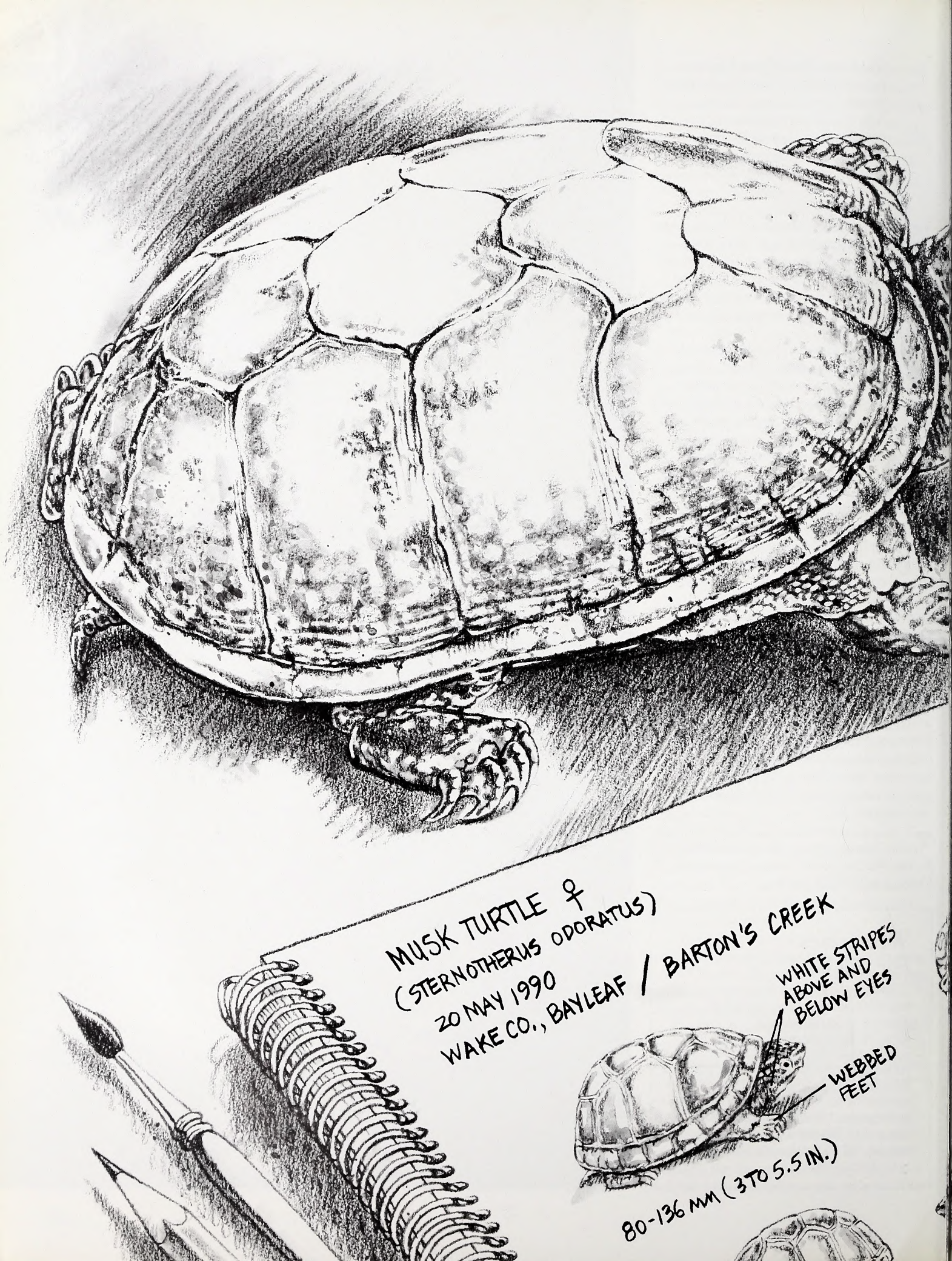
Just how priceless is such information? More than once the discovery of a rare species in an area has helped to protect our game lands from damage or appropriation by competing interests. Rare creatures can help us save these areas. And, in turn, we can help save the rare creatures. That makes it a good deal for both. ☒

Allen Boynton is mountain project leader for the Wildlife Commission's Nongame and Endangered Wildlife Section.

Who Cares For Wildlife?

You do, of course, and that's why you may like to know you can earmark a donation to specifically help nongame and endangered wildlife. Make your contribution directly or through the income tax checkoff to the Nongame & Endangered Wildlife Fund, N.C. Wildlife Resources Commission, 512 N. Salisbury St., Raleigh, N.C. 27604-1188.

NORTH CAROLINA NONGAME & ENDANGERED WILDLIFE FUND


MUSK TURTLE ♀
(STERNOTHERUS ODORATUS)
20 MAY 1990
WAKE CO., BAYLEAF / BARTON'S CREEK
WHITE STRIPES ABOVE AND BELOW EYES
WEBBED FEET
80-136 MM (3 TO 5.5 IN.)

Asleep in the Deep

A basketful of baby musk turtles and a backyard eyesore introduced me to the complex way some creatures survive the winter under water.

written by David S. Lee
illustrated by Jimmy Brown

When we were traveling long distances, my parents would often humor me by turning onto side roads, stopping to allow me to poke around for toads, snakes and other lowly creatures of youthful interest. If I was lucky enough to find something and capture it, I always begged to take it home. (It took me some years to realize that the more important my find, the less likely it would be allowed in the car.) Once in south Florida, I discovered an abandoned fish trap under a bridge, retrieved it from the water and found it full of young musk turtles. To my delight I was allowed to keep them. They were carefully released in a concrete backyard pool that I had designed and constructed specifically for aquatic turtles at my home in Maryland. I had created what was unanimously recognized as the number one neighborhood eyesore, but my turtles liked it and so did I.

Winters came and went, and each spring after the ice melted, I'd clean the pool and count my turtles. I was pleased to see that all of the musk turtles survived season after season.

How did these turtles from south Florida survive sub-freezing Maryland winters. Like most northern turtles, they hibernated. I did not make much of it then, but thinking back, it is interesting to ponder how a genetic stock of south Florida turtles had the behavioral instincts and physiological abilities to hibernate for four months in an ice-covered Maryland pond. Although musk turtles range well to the north of Maryland, these were able to use a previously untested ability to cope with winter.

For animals that cannot make a living during the winter, hibernation is a great way to avoid the problems of cold and unavailability of food. The process — as explained in high school biology classes — is quite simple. Store up lots of fall fat reserves and when things get unbearable, lower the metabolic rate and sleep through the bad weather. This takes a lot less energy than trying to relocate

Asleep in the Deep

buried hickory nuts under 16 inches of snow or migrating thousands of miles to some South American country.

Yet, though the principle of hibernation may be simple, the execution of the process is complex. Built-in problems must be addressed if the animal is to see the spring.

Those problems become magnified in air-breathing animals that escape the cold by burrowing in the mud at the bottom of ponds. Examine the situation from the point of view of my musk turtles. Excluding some mud turtles that seem compelled to crawl out onto land to hibernate underground, nearly all North American turtles spend the winter underwater. Even the wood turtle that lives for the summer as a terrestrial woodland reptile withdraws to aquatic habitats for hibernation. There are in fact advantages to wintering in ponds, the most striking of which is the behavior of water itself.

Water is capable of absorbing and storing tremendous amounts of heat with only a slight increase in temperature. It cools off just as slowly as it warms up, meaning that aquatic life undergoes relatively moderate fluctuations in temperature. Another quirk of water is that at 39 degrees Fahrenheit water achieves its greatest density and sinks to the bottom of ponds. At all other temperatures, both warmer and colder, it rises. For our musk turtles this means that as long as they are in a pond deeper than the local frost line, the bottom temperatures in winter will stabilize at about 39 degrees. This microclimate is quite comfortable for turtles and other creatures hibernating at the bottom of ponds. If the water becomes cooler than 39 degrees, the cooler water rises. Thus the turtle can never become frozen. When the bottom finally begins to warm in spring, the change sets off a biological alarm clock in the turtle and it awakens.

But the property of water that keeps the coldest layers above the bottom of the pond potentially could be deadly to an air-breathing creature like the turtle. At 32 degrees water expands and freezes, leaving an impenetrable self-sealing layer of ice between the pond's surface and the hibernating creatures trying to get a good winter's nap. In northern latitudes ice may persist for up to four months. That's a long time to hold a breath — too long, as a matter of fact. Living cells need oxygen, and holding your breath — or, in the turtle's case, simply not breathing — works only for short periods. With lots of practice an animal like ourselves can go for perhaps five minutes without breathing. Some seals can dive for an hour or so before they have to surface to breathe, and large whales have been timed at an hour and a half.

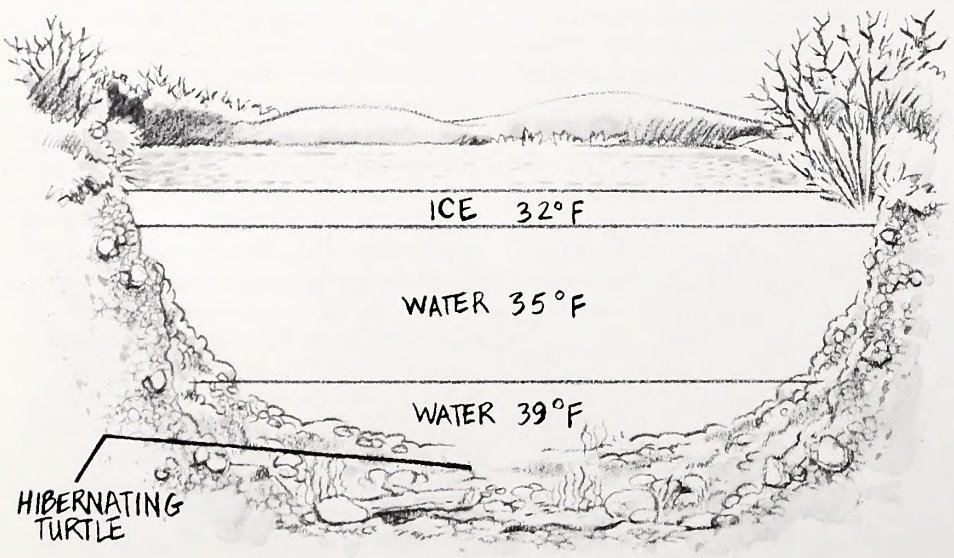
How do turtles get enough oxygen to survive their winter's nap? For one thing, their 39-degree blanket at the bottom of ponds has remarkable benefits for low oxygen use. If the water were warmer, the turtles would use more oxygen; colder, and their cells — being made primarily of water — would freeze. Jagged ice crystals rupture cell walls from within, and if enough cells were broken the turtle would die.

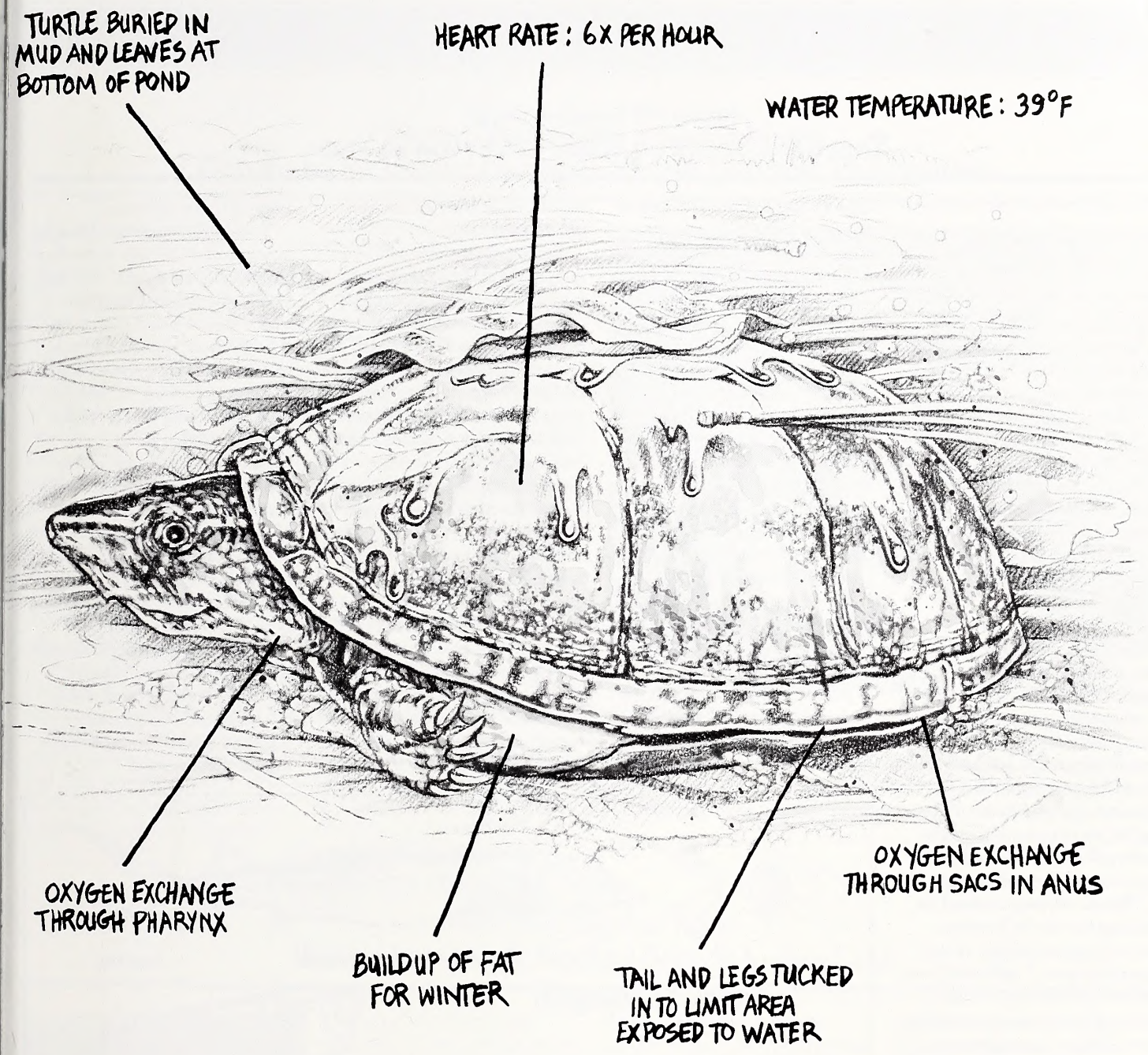
Thus a hibernating turtle is sleeping in a snug zone of perfect temperature for its temperamental cells. Yet with its submerged lungs unable to breathe, the turtle still faces slow oxygen starvation and a lethal buildup of carbon dioxide. Hibernating amphibians, such as frogs, solve this problem by breathing directly through their skin and are thus able to retrieve oxygen from the water. Turtles and other reptiles, however, have skin clothed with thick scales and, of course, a major portion of the turtle's body is covered with a shell. Absorbing oxygen through the skin is no more an option than flying south, although migration might seem easier than solving the built-in problems of hibernation.

But the turtle solved them by means of a couple of remarkable adaptations. Aquatic turtles, like the musk turtle, have two sources of oxygen to satisfy their winter needs. One is their throat cavity, which is lined with lots of minute blood vessels that permit oxygen to be extracted from the water. The second is a similar type of tissue present in two thin-walled sacs near the anus. A small amount of food coloring placed near a captive turtle sleeping on the bottom of an aquarium will show faint independent pumping movements of water at each end of the turtle. To demonstrate the turtle's effectiveness at breathing through its anus and its pharynx, researchers submerged captive turtles for up to eight days. All the turtles survived. Cold water traps and holds more dissolved oxygen than warm water, thus assuring that additional oxygen is available under ponds.

While these capabilities augment oxygen, they do not, by themselves, get a hibernating turtle through an entire winter. Perhaps the threat of slow oxygen starvation in wintering musk turtles can be explained by the example of a long-distance runner. Runners who push themselves to their limits often experience the consequences of muscle cells trying to perform on insufficient oxygen. Normally, muscle tissues are fueled by oxygen-burned carbohydrates. But as the system is stressed, runners experience shortness of breath because it is difficult to take in enough oxygen. In times past when running abilities were used for more immediately rewarding activities, like escaping large predators, it was important to continue to function even when you knew you couldn't. In these emergency situations, the skeletal muscles can operate short-term on an alternative process known as anaerobic glycolysis. In simpler terms, you burn sugar and derive energy without oxygen. Though this fuel-burning process won't keep you going for very long, the survival value is obvious. The mammalian heart and brain can go anaerobic (without oxygen) for only a few minutes. Any longer deprivation results in rapid energy shortage and a by-product of lactic acid that can lead to leg cramps, among other drawbacks. An extreme result is a chemical imbalance called acidosis which is potentially fatal.

The hibernating musk turtle, however, can get away with oxygen deprivation for much longer periods because its metabolism is lower





than mammals'. Turtles don't do much and live for relatively long times (perhaps there's a lesson here). Their metabolic rates are normally 10 times lower than those of warm-blooded animals of similar size. In hibernation this drops by 10 to 20 percent of the normal tranquil rate. Turtle hearts that beat 40 times a minute on a warm day in July drop to one beat every 10 minutes in the winter.

So it's simple enough, after all. A musk turtle's anaerobic metabolism gets it through the winter, right? Well, almost. There is still a buildup of lactic acid to deal with for the months the turtle is sealed under the ice. Naturally, the turtle slows the buildup by doing next to nothing throughout the winter, but its body functions still produce enough toxin to kill it before winter runs its course. Again, the solution is quite simple. Minute amounts of calcium salts from the turtle's shell are slowly dissolved into its bloodstream. These salts act as a buffering agent, neutralizing the lactic acid.

Researchers at Brown University in Rhode Island, using enough sophisticated equipment to intimidate a space scientist, have been tracking the internal chemical balances of turtles for some time. In tracing the calcium, they discovered these salts perform another invaluable service. Acidosis can depress the heart rate so much that it stops, but the calcium keeps the pump on schedule.

One day, these studies may have implications for enhancing knowledge of clinical problems of more interest to us, but for the moment the researchers are simply trying to understand turtles. Meanwhile, under the ice, and above it, the life of gray winter days goes on, with each plant and animal using its own mechanisms to survive. The days grow longer, water in its solid state melts, and sometime in March or April the turtles once again poke their noses into the air, filling their lungs with oxygen. While they can neither sigh nor smile, the first breath of spring must be an emotional moment, even for a sleepy turtle. Then, as the first sunny days arrive, our turtle neighbors will haul themselves out on a log to bask and raise their body temperatures above that of the water.

This will allow... well, that's another story.

Report All Sturgeon Caught

Shortnose Sturgeon Study Underway in State

Written and Edited by Vic Venters

Researchers studying the shortnose sturgeon — the only federally-listed endangered marine fish species in North Carolina — are asking the public to report any captures made in the Cape Fear River drainage of this rare species. An intensive study of both shortnose and Atlantic sturgeon is underway in the river system to determine abundance and distribution patterns for the fish.

Biologists with the N.C. Cooperative Fish & Wildlife Research Unit have tagged a number of fish of both species — some with orange disks and others with ultrasonic transmitters. While sturgeon fishing is not widely practiced in North Carolina, the prehistoric-looking fish are occasionally caught in the gill nets of shad or herring fishermen in the early spring.

"We are offering a reward for information on the location, time of capture and size of any tagged sturgeon," said Steve Ross, research coordinator for the National Estuarine Research Reserve. "Also, if you capture or sight any shortnose sturgeon in the Cape Fear drainage, please notify us." Researchers are hoping to gain some insight into reasons why sturgeon populations have crashed dramatically in the 20th century.

Shortnose sturgeon were thought to be extinct in North Carolina until a commercial fisherman hauled one from the Brunswick River in 1987. This catch was the first confirmed shortnose documented in North Carolina waters since 1881. Shortnose sturgeon are protected by both state and federal law, although the unintentional capture and release of shortnose sturgeon will not incur state or federal fines.

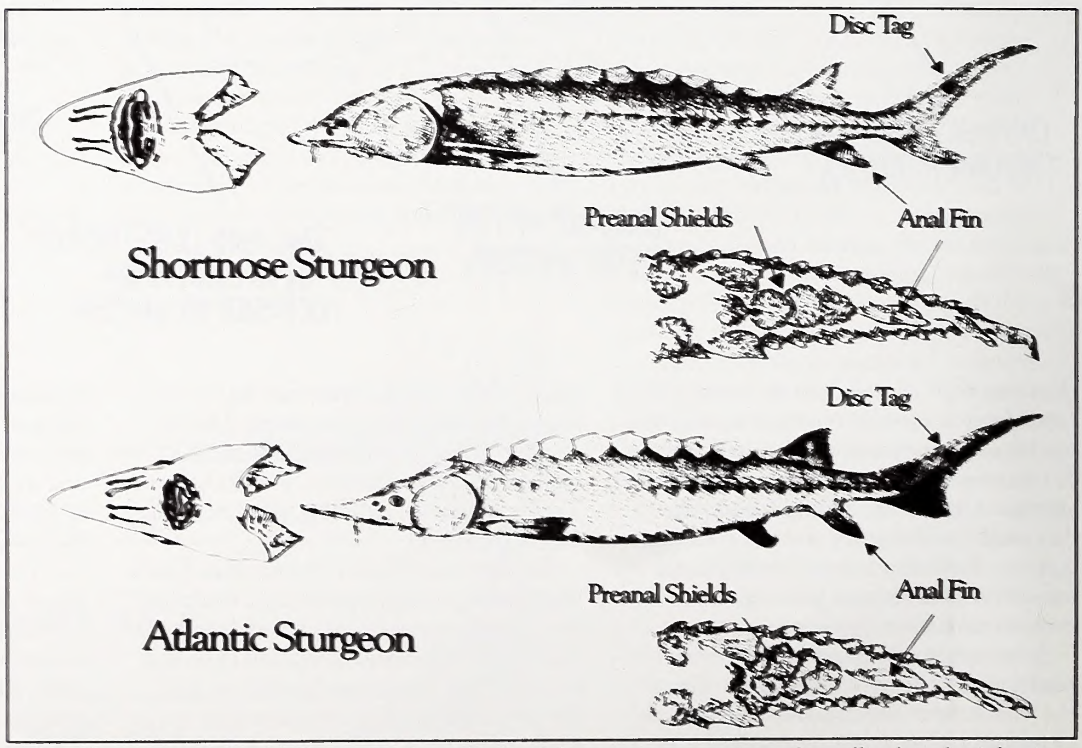
Shortnose sturgeon are sometimes confused with the larger Atlantic stugeon, which also spawn in Eastern rivers. Both are superficially similar, although the Atlantic sturgeon grows to over nine feet in length and can exceed 1,000 pounds. Unlike the Atlantic, shortnose sturgeon rarely exceed three feet. To protect the shortnose from fishing pressure, all sturgeon smaller than three feet in length must be released unharmed.

The shortnose sturgeon has a wider mouth and more rounded snout. The two species can also be differentiated by the pattern of preanal shields located on the underside of the fish, just in front of the anal fin. The shortnose has only one row of preanal shields, while the Atlantic sturgeon has two rows.

Both species of sturgeon require clean rivers in which to spawn. Pollution, dams and excessive commercial fishing have led to serious declines in both species throughout their range. Although shortnose sturgeon range from the St. John's River in New Brunswick, Canada, to the St. John's River in Florida, spawning populations have been reduced to a few isolated rivers along the Eastern seaboard. "In the Carolinas, the only healthy breeding population we've found appears to be in the Pee Dee river," Ross said. "It's a safe bet that the Cape Fear once had a breeding population, but we don't know if the shortnose in the Cape Fear drainage are breeding here or just visitors. The study should help answer some of those questions."

Both species migrate upstream from estuaries to river spawning grounds in January and February. Unlike the Atlantic sturgeon which migrates back out to sea, the shortnose appears to reside near its home river throughout its lifespan, making the species more susceptible to river pollution and overharvest.

Anyone who catches either species of sturgeon in the Cape Fear drainage should contact Mary Moser or Steve Ross at the N.C. Cooperative Fish & Wildlife Research Unit, Brunswick Biology Lab, Box 10429, Southport, NC 28461, or call (919) 457-3397. Fishermen should note the location, time of capture, size of the sturgeon and, if the fish is tagged, the tag number. You must record the tag number to collect the reward.



Scarce Shortnose: *Superficially similar, the endangered shortnose sturgeon is much smaller than the Atlantic sturgeon. Fishermen in North Carolina should report any tagged sturgeon of either species or any shortnose sturgeon they catch.*

Volunteer Hunting Safety Instructors Needed

New Rules for Buying Hunting Licenses Effective This Summer

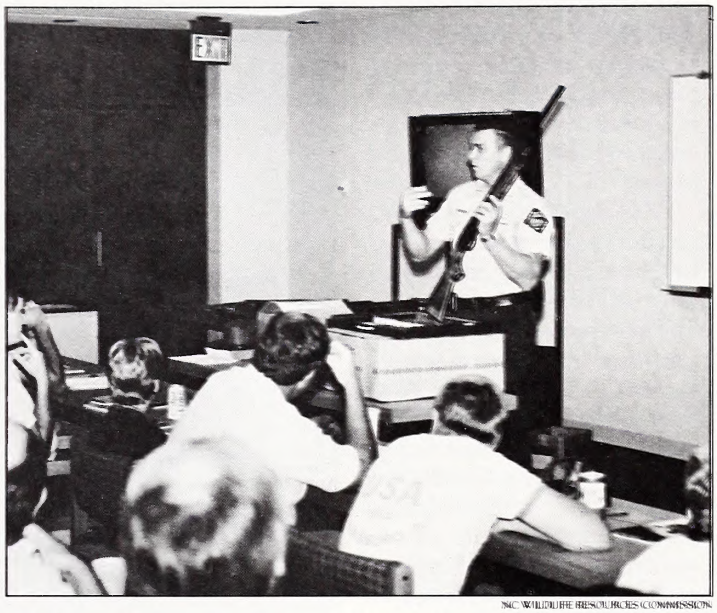
Although the hunting season is winding down, be sure to retain your old hunting license after the season closes. At license renewal time in July 1991, potential hunting license buyers for the 1991-92 season must show proof that they have either purchased a hunting license previously or have passed a certified hunting safety course. An expired hunting license will serve as proof of prior purchase. First time hunting license buyers must have passed the certified hunting safety course.

This new law is an addition to the state's hunting safety requirements. These hunting safety requirements have resulted in a decrease in hunting fatalities and accidents in North Carolina.

During the last 15 years, about 20,000 students have been certified each year. Due to the new license purchasing requirement, however, enrollment in hunter safety classes is expected to double during the coming summer months as renewal time nears.

Because of these expected enrollment increases, the Wildlife Resources Commission is seeking voluntary hunter safety instructors to help teach the hunter safety classes. Voluntary instructors will need to complete an instructor's course before they are certified to teach the hunter safety classes. In order to take the instructor's course, volunteers should be 21 years of age or older and have graduated from the hunter safety course. The course requires a minimum of 10 hours of instruction.

Persons interested in becoming a voluntary instructor should contact their local Wildlife Resources Commission officer or contact the Division of Enforcement of the North Carolina Wildlife Resources Commission by calling (919) 733-7191.

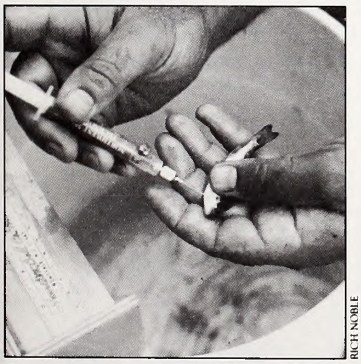


N.C. WILDLIFE RESOURCES COMMISSION

Safe Shots: *Sportsmen buying or renewing hunting licenses from July 1991 will be required to have passed a certified hunting safety course or show proof of prior hunting license purchase. This new law is expected to double enrollment in hunting safety classes. The Wildlife Commission needs volunteer hunting safety instructors.*

Bass Clubs Help With Funds

Researchers Study Stocked Bass At Jordan Lake



RICH NOBLE

Researchers at *North Carolina State University are conducting a tagging study of largemouth bass at Jordan Lake to evaluate stocking programs. The researchers tag the bass by injecting micro tags made of individually coded wire.*

Money raised from bass fishing tournaments across North Carolina is helping fund a study examining the movement and survival rates of recently stocked largemouth bass in Jordan Lake.

Fisheries biologists with the N.C. Wildlife Resources Commission say that historically, supplemental bass stocking in lakes where bass population already exist has been unsuccessful. But a research project underway at Jordan Lake suggests that supplemental stocking may provide beneficial results.

Fisheries biologists with N.C. State University are working under contract with the Wildlife Commission to study largemouth bass. Their research on the Jordan project indicates that bass stocking may be successful when used in specific areas of some lakes. The project will receive an additional $1,200 from the proceeds of fishing tournaments held by bass clubs across the state.

With these funds, 1,500 fingerling bass will be tagged with microscopic, individually coded wires. Recaptures of electro-shocked tagged bass will reveal whether these bass survive, grow and find desirable habitat as well as do wild bass.

"This money allows us to go further with our research, and improve bass fishing opportunities," said Fred Harris, chief of the Commission's Division of Boating and Inland Fisheries. The study is being conducted by John Copeland and Randy Jackson, graduate students in the Zoology Department at N.C. State University. Donations have come from the N.C. BASS State Federation, the Pigeon Valley Bass Masters in Canton, the Poor Boys Bass Club in Raleigh, Port City Bassmasters in Wilmington, the Kernersville Bass Anglers in Mocksville, and the Sons of the American Legion Post 116 in Fuquay-Varina. The bass fund was created in 1988 so that individuals and fishing clubs could donate money for research on black bass.

— *Angela Dorman Hill*

Pen-Raised Birds Carry Diseases

Illegal Releases Threaten Wild Turkey Populations

Biologists with the N.C. Wildlife Resources Commission are seeking the public's help in preventing the illegal release of pen-raised, or domestic turkeys into the state's wild turkey populations.

Some domestic turkeys, usually raised on game farms, have been released in areas where wild turkeys are found. The most recent discovery of pen-raised turkeys was in southwestern Randolph County. A domestic bird that had been released into the wild began feeding with chickens on a farm. The bird's head was swollen and tests showed the bird was infected with a disease that could cause a crash of North Carolina's wild turkey population.

The state's wild turkey population is estimated to be at a 40-year record high. "It's really disturbing that this diseased, pen-raised turkey was discovered in an area where so much effort is being made to restore the wild turkey population," said Mike Seamster, the Commission's wild turkey project leader. "Our restoration efforts could be seriously jeopardized by the release of pen-raised birds."

Several wild turkey restoration projects have been completed in Randolph, Moore, Montgomery and Rowan counties — the area where the bird was found. Additional restoration efforts are planned in Davidson and Stanly counties.

"Domestic and game farm birds receive medication daily to resist diseases that are fatal to wild birds," Seamster said. "But these domestic and game farm birds may still act as carriers of the diseases, and if they are released into the wild, they are capable of spreading diseases to the wild turkey population."

Most game farm turkeys are a cross between a domestic and wild turkey. They, like domestic turkeys, are not adapted to life in the wild. "It's often called genetic pollution," Seamster said. "Domestic birds have smaller brains and shorter legs and cannot fly or run as well. When wild turkeys breed with these pen-raised birds, their offspring aren't as capable of surviving in the wild either.

"We want to inform well-meaning people that it's illegal as well as a health risk to release domestic birds into wild populations." Under the Commission's turkey restoration program, biologists and technicians trap wild turkeys and release them in different areas of the state in hopes of establishing a population.

"People hear about us restocking turkeys and think they're helping us by releasing game farm turkeys," Seamster said. "We have in North Carolina some of the purest strains of wild turkeys in the Southeast. The only effective way to establish populations of wild turkeys is through live trapping and relocation of purely wild birds."

— Angela Dorman Hill

KEN TAYLOR

The Right Way: *By restocking and relocating wild turkeys to suitable habitat, the Wildlife Resources Commission has greatly increased the numbers of these wily birds in North Carolina. However, the illegal release of pen-raised turkeys into the wild by individuals worries biologists because pen-raised turkeys can spread diseases to the wild stock as well as weaken their ability to survive in the wild by interbreeding.*

"This is going to hurt me more than it does you."

Report Tagged Fish

Reward Offered in Herring Study

With herring fishing season right around the corner, North Carolina Fishermen should keep an eye out for tagged herring. Fisheries biologists from South Carolina will pay fishermen $5 for each tag they return that has been attached to a blueback herring.

Fisheries biologist Doug Cooke with the S.C. Wildlife and Marine Resource Department, said the $5 payment is an incentive for fishermen along the Atlantic Seaboard to cooperate in a herring tagging study. The tagging study is designed to gain more information about the migratory patterns of blueback herring.

Cooke said tags have been returned from fishermen as far away as the Bay of Fundy in Canada, the Gulf of Maine and Massachusetts.

Tags should be sent to Doug Cook, Dennis Wildlife Center, P.O. Box 190, Bonneau, SC 29431.

— Angela Dorman Hill

Deer Experts Featured

Dixie Deer Classic Held in March

The Dixie Deer Classic will be held March 1 through 3 in the Jim Graham Building at the North Carolina State Fairgrounds in Raleigh.

The 1991 Classic will feature lectures and seminars by the nation's best deer hunters and experts, as well as deer head collections and extensive commercial displays of hunting equipment, guides and outfitters.

Noted experts to speak include Chuck Adams, Noel Feather and Joe Hamilton.

Each year, hundreds of deer heads from North Carolina and the Southeast are brought in for scoring according to Boone and Crockett standards. This year's entries will be on display in their respective categories, with awards being made to the best in each category.

For more information, contact the Dixie Deer Classic, c/o Wake County Wildlife Club, P.O. Box 12202, Raleigh, N.C. 27605, or call (919) 833-5550.

Calendar

Feb. 1-2

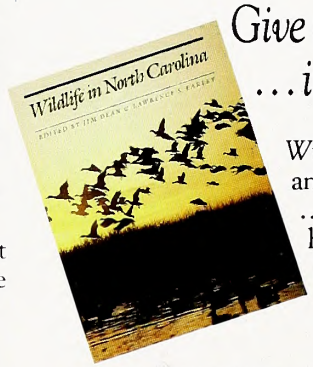
The North Carolina State Chapter of the National Wild Turkey Federation will hold its annual state convention at Gateway Convention Center, Sheraton and Comfort Inns, U.S. Hwy. 64 By-Pass, Rocky Mount. The convention will feature prominent wild turkey expert Ray Eye of H.S. Strutt Inc. An awards banquet is scheduled for Friday evening, followed by the convention agenda and state championship wild turkey and owl calling contests. For more information, contact Terry Hill, Seven Lakes, Box 608, West End, NC 27376 or call (919) 673-2982.

Feb. 23-24

Showcase of Woodcarvings at Grady Cole Center will feature judged competition, carving demonstrations, a wide selection of carvings, carving tools and supplies. The show will be open to public and free. For more information, contact Showcase of Woodcarvings, 14118 Amory Drive, Charlotte, NC 28204.

April 13-14

The third annual WRAL-TV Carolina Coastal Celebration will feature boat building, net making, coastal folklore, seafood cooking, children's activities and more. The free, two-day event at the N.C. State Fairgrounds is part of WRAL's "Save Our Sounds" project, an effort to involve North Carolinians in preserving our fragile coastal resources. For more information, contact Save Our Sounds at (919) 821-8790.



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Habitat Tips Help Wildlife

by Vic Venters

How many times have you promised yourself that you were going to take on some type of improvement project, only to discover several months later that your "window of opportunity" for beginning it had somehow passed, or been forgotten or mislaid in the ever-present jumble of daily life?

Probably quite often, as it turns out. With this in mind, *Wildlife in North Carolina* has inaugurated a new monthly column with the sole purpose of reminding the reader to attend to matters before it's too late in the season to do them. Our topics, naturally, will spotlight wildlife issues, with an emphasis on habitat improvement — be that creating small game food plots, managing a farm pond, building a bluebird box or any of a host of important improvements that you can do to help the wildlife and environment of North Carolina.

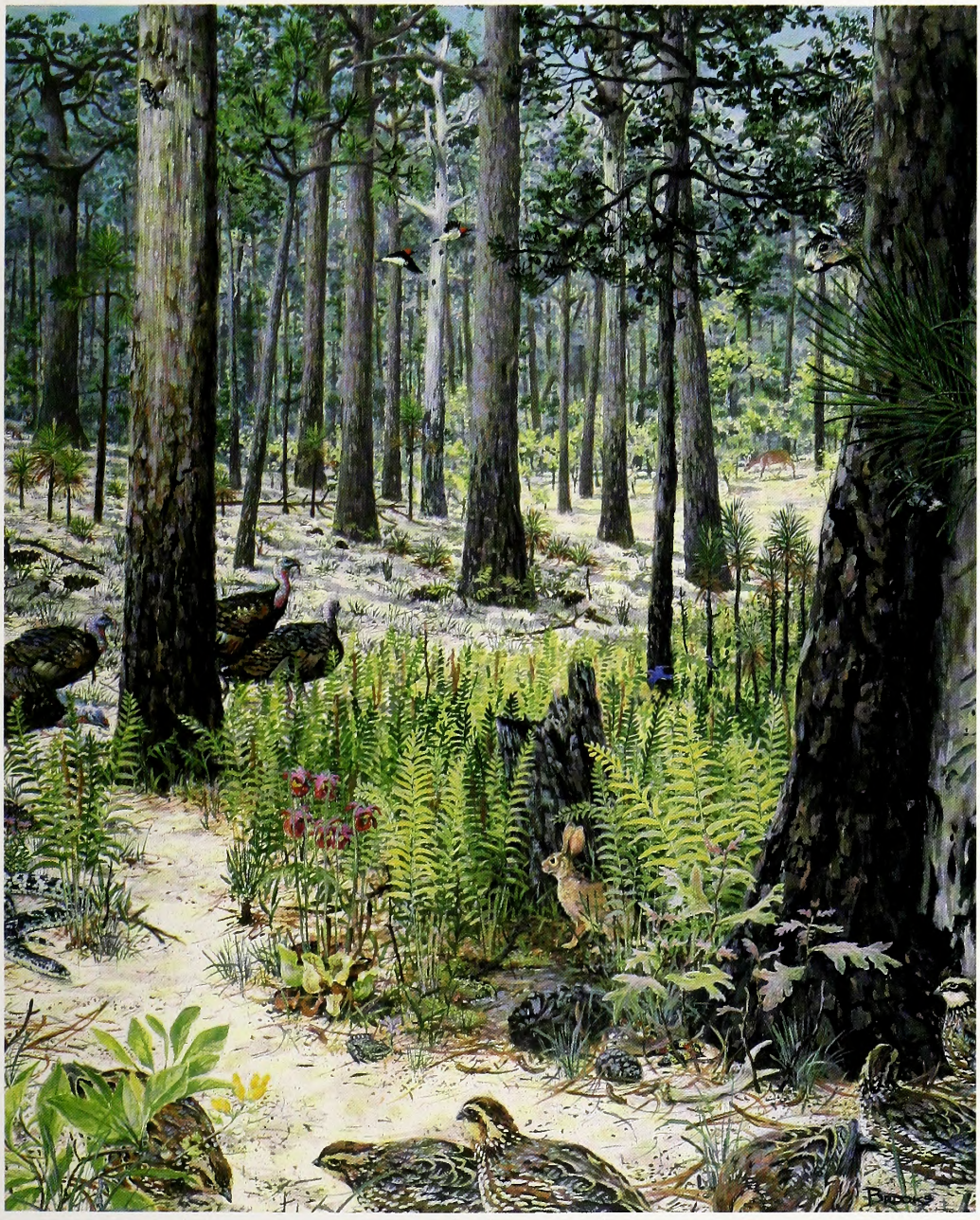
We'll also include tips to remind you when it's time to attend to regulatory matters such as renewing your license or ways that you can assist the Wildlife Resources Commission in protecting and enhancing our state's natural resources. Each issue's topics will be appropriate for the month in which they appear.

As habitat grows increasingly fragmented and pressured by a growing human population, the future of our wildlife and environment will become ever more dependent on the responsible management of remaining habitat. And it's no secret that most of North Carolina's wildlife habitat is in private hands — your hands. We hope you find these tips useful.

• For small game habitat improvement, you should begin prescribed burning in February and early March. Prescribed burning is one of the most useful techniques for improving small game habitat — it fertilizes the soil, removes litter and kills invertebrates that parasitize quail. Without fire, hardwood sprouts and young pines soon shade out the more desirable grasses and weeds utilized by quail and rabbits. Before burning, however, the N.C. Forest Service must be contacted. Also, consult with one of the Wildlife Resources Commission's field biologists for assistance on what areas to burn and how much should be burned. Call the Division of Wildlife Management at (919) 733-7291 for the names and addresses of the field biologist nearest you.

• This month is an excellent time for farm pond owners to check the water quality of their ponds in preparation for fertilization later in the spring. in the spring. Ponds with acidic or soft water do not respond well to fertilization. By measuring the pH and hardness of the water, you can determine whether or not an application of lime is necessary before beginning fertilization. For existing ponds, the pH can be measured by the North Carolina Soil Testing Laboratory, by using litmus paper available at swimming pool supply dealers and drugstores, or by contacting your local Wildlife Resources Commission fisheries biologist. For addresses of biologists or for more information, contact the Division of Inland Fisheries at (919) 733-3633.

Sandhills Longleaf Pine Forest



Brooks Pearce

To purchase your signed and numbered, limited edition art print, see the order form on page 33. Print proceeds benefit the Nongame and Endangered Wildlife Fund.

Birds Away

Even the steadiest nerves are tested when a covey of bobwhites goes airborne, and it's tough to concentrate on a single bird. How can you miss? It's all too easy.

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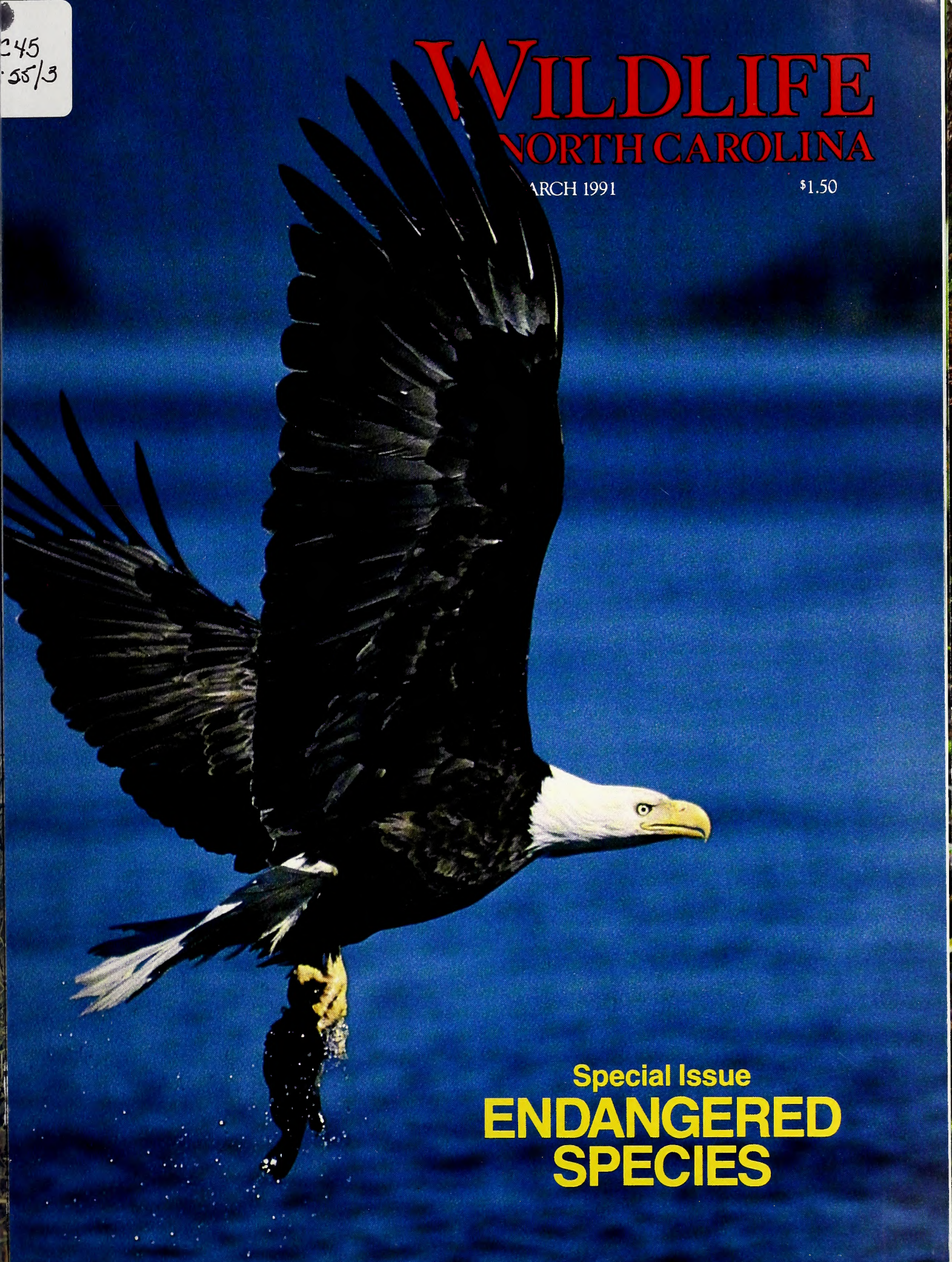

Special Issue
ENDANGERED SPECIES

Snail Darter

One Battle We Dare Not Lose

It's been more than a decade since the diminutive snail darter became the first endangered species to draw national attention by temporarily holding up construction of the $120 million Tennessee Valley Authority dam on the Little Tennessee River. That startling capability demonstrated the power of the relatively new Endangered Species Act, but it didn't win the snail darter many friends. Indeed, its supporters and the federal legislation that protected it were widely ridiculed. Radio columnist Paul Harvey was but one of many who heaped abuse on the tiny fish that was holding up progress.

Not surprisingly, how you felt about the snail darter became a litmus test in a new era of environmental awareness and stewardship. That was good, but in this case, it obscured a much broader issue at Tellico Plains — whether it was wise to trade 38,000 acres of prime farmland, sacred Cherokee ancestral lands of historic importance and 17 miles of the finest wild trout stream east of the Mississippi River for a dam that could not generate electricity and wasn't needed for flood control or recreation.

The battle over the Little Tennessee River was never a pure case of an endangered species versus development, of snail darter versus dam. Instead, it was a fight to save the last fragment of a river and rich bottomlands that were already providing unique recreation and growing economic benefits in a region potholed with 61 TVA artificial lakes. It was also a long and sordid affair that revealed TVA's questionable land-development deals and opportunistic cost-benefit manipulations. Yet, in the end, the river was lost.

In many ways, the snail darter controversy marked an unpromising beginning, and did little to convince the nation of the need to protect endangered species. Yet, efforts to save threatened, endangered and nongame species have gained momentum throughout the decade. Ironically, even the snail darter has survived, having been transplanted to nearby waters. Despite frequent attacks, the Endangered Species Act remains intact and has even been strengthened. Bald eagles, alligators, peregrine falcons and brown pelicans are among the key species we once thought were surely doomed, yet they have responded so dramatically to restoration efforts that attention is now turning to less well-known species.

Such good news seemed beyond hope a scant 10 years ago, but as this special issue of *Wildlife in North Carolina* reveals, this is not time for overconfidence. The problems facing endangered species are incredibly complex, and they will be with us the rest of our lives. Fair enough, some would say, since we caused most of the problems. If we don't solve them, we will be next on the list.

— Jim Dean

REPRINTS: Reprints of this special issue are available upon request. Multiple copies up to 25 can be ordered by writing: Endangered Species Publication, Division of Conservation Education, N.C. Wildlife Resources Commission, 512 N. Salisbury St., Raleigh, NC 27604-1188. Include a UPS-deliverable address.

March 1991
Volume 55, Number 3

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WILDLIFE IN NORTH CAROLINA

Wildlife in North Carolina is the official educational publication of the North Carolina Wildlife Resources Commission, and is dedicated to the sound conservation of the State's wildlife and other interrelated natural resources and the environment we share with them.

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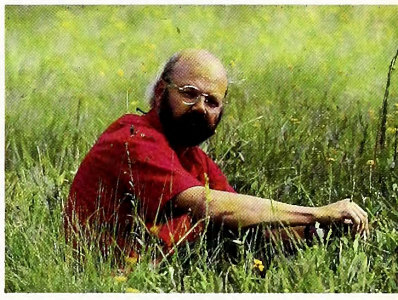

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You bet! Here's how to get started.

Cover *Once a truly rare sight, a bald eagle picks up a fish for lunch in a large lake. Not too many years ago, many feared this noble national symbol would become extinct. Photograph by Scott William Hanrahan.*

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Red-cockaded woodpecker
(Endangered U.S., N.C.)
Protected by state and federal laws, the red-cockaded woodpecker has been threatened by the decimation of once-extensive longleaf pine forests. Habitat destruction is the most common cause of endangerment for plants and animals.

DERRICK HAMRICK

The Race to Save Life on Earth

The rate of extinction is accelerating worldwide for plants and animal species. What are the causes, and why should we care?

by Vic Venters

"Woodpeckers Stall Road Projects" read the headline topping a recent article in the Raleigh *News and Observer*. The article explained how the red-cockaded woodpecker—a federally endangered species—was delaying a road-widening project in Moore County and increasing its costs. Unless agreements with the federal government could be worked out, the project's future was in doubt. Worse yet for the highway builders, colonies of the bird had been seen around nine other road construction sites around the state, while another 21 planned construction areas were identified as potential woodpecker habitat.

According to the article, state highway officials were working with the federal government to find what they called a "middle ground," a way, that is, to protect the woodpecker's habitat *and* build the road. In an attempt to minimize impact on the birds, plans for the road widening were being scaled down.

Whatever the outcome, the woodpecker/road issue in eastern North Carolina illustrates how difficult it is to protect rare or endangered plants, wildlife and habitat. As our society has discovered, it's quite easy to support endangered wildlife protection on paper; it's an altogether different matter when the costs begin to be assessed.

Why should we even care about a few woodpeckers, or any other endangered species for that matter? Roads, after all, are needed for continued growth, development and population expansion. And with the economy slumping, aren't jobs and thick wallets more important than a species most people have never heard of? And if we *have* to save endangered species, where is that "middle ground"?

On a global scale, the same questions are being asked over and over as the world edges toward a massive extinction "spasm," a biotic holocaust repercussions of which have yet to be felt. One thing is clear. "The living world," as writer Farley Mowat puts it, "is dying in our time." Today we face what may become the worst mass extinction ever, and humans are virtually the exclusive cause of it. Scientists estimate that the earth is losing up to 40 species *per day*, compared with the pre-modern-era average of one extinction per year. In as few as two decades, scientists estimate, the earth will be losing several hundred species per day.

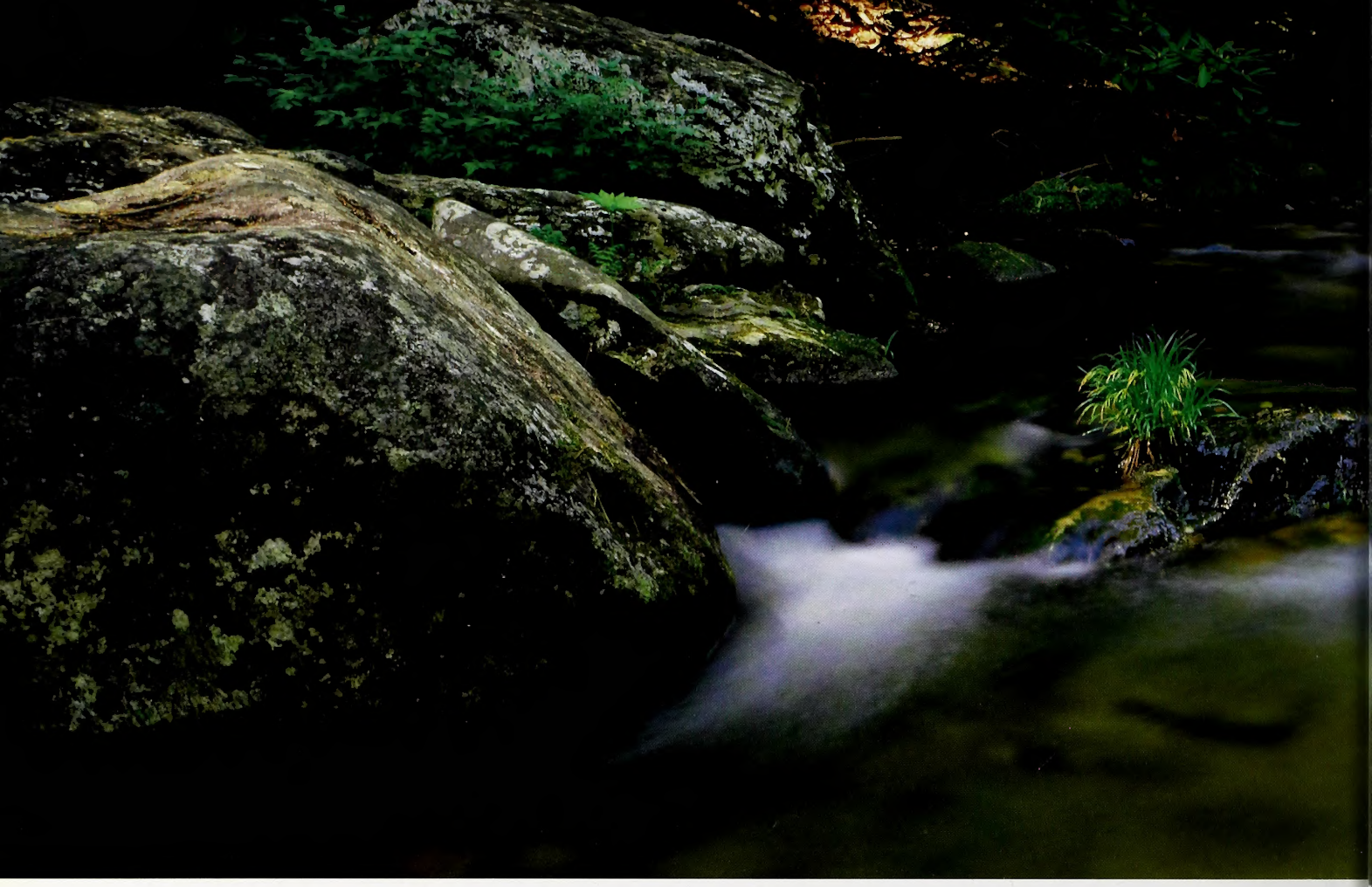
More frightening still, some scientists predict that this biological Verdun may directly threaten Mankind's existence on Earth by the end of the 21st century. By then, no one will ask "Why should we care?" By then, perhaps, it may be too late.

Extinction per se, it should be emphasized, can hardly be blamed entirely on Humanity. The fossil record shows that extinction seems to be the eventual fate of all species. In fact, of the perhaps one-half billion species that have ever existed on earth, about 99 percent have become extinct or evolved into an organism different enough to be called another species.

The natural causes of extinction have been varied throughout the last 600 million years of life on Earth. For instance, near the end of the Permian Period, some 250 million years ago, up to 96 percent of all marine animal species were eliminated in a wide-sweeping mass extinction. Geologic evidence in the form of iridium—a substance rare on earth but common in asteroids—suggests that about 65 million years ago, a giant asteroid slammed into the earth with more than 10,000 times the energy of all the world's

ROB GARDNER

Smooth coneflower
(Endangered N.C.)
Researchers have barely begun to tap plants' medicinal benefits, one reason to preserve all species. The coneflower genus was highly valued by Native Americans. Today its properties contribute to over 200 medical products.



***Once among the most** pristine in the state, mountain waterways in recent years have been loaded with sedimentation from construction projects. Poor water quality is one reason why so many fish and mollusk species statewide have been proposed or are listed for protection.*

nuclear weapons, setting the globe alight and killing off the dinosaurs and thousands of other species at the end of the Cretaceous Period. At other times, severe climate change, perhaps caused by intense volcanic activity, has led to mass extinctions. In other cases, new competitors or predators have evolved, making some species "obsolete."

In the past, the extinction of a species has generally made room in ecological niches for new life-forms to evolve. For example, when the dinosaurs became extinct 65 million years ago, mammals gradually diversified and evolved to establish their ascendancy as the dominant life-form on Earth.

Today's extinctions are different. There are no evolutionary replacements for current extinctions — species are disappearing so rapidly that none are having time to evolve. For the first time in millions of years, the Earth's biotic diversity — meaning the millions of living organisms found on the globe — is threatened on a large scale.

Man has found a variety of ways to eliminate or endanger species.

- Pollution of our land, air and water is a by-product of industrialized societies. Animals and habitat are either directly eliminated by pollution or suffer the long-term and insidious effects of food chain pollution. Toxic chemicals — DDT being an obvious example — work their way into the food chain and remain there, poisoning life for decades. Acid rain, a by-product of the burning of fossil fuels, threatens not only individual species but also entire ecosystems across national and continental boundaries.
- Species that man introduces from one ecosystem to another ecosystem often have a devastating effect on native flora or fauna. Native species often have no natural defenses to cope with the introduced threat. For instance, the brook trout — North Carolina's only native salmonid — continues to lose ground each year to hardier rainbow and brown trout introduced from the western United States and Europe respectively.
- Modern overkill through excessive harvest is another way man eliminates species. Since 1600, unregulated or badly regulated hunting — usually for commercial purposes — has been at least partially to blame for the demise of every North American bird to become extinct. The passenger pigeon and the Carolina parakeet are two notable North American examples.
- The fourth — and certainly least reversible — cause of extinction is the destruction and alteration of habitat. Pollution can be cleaned up, overkill stopped and introduced species can sometimes be controlled. But when a crucial habitat is eliminated, not only do species suffer, but also any chance of evolutionary replacement.

Nowhere is the phenomenon of habitat destruction and man-caused extinction greater than in the tropical rain forests of South America and Southeast Asia. Although these rain forests only cover about 7 percent of the Earth's land surface, they are estimated to contain about two thirds of all Earth's species, perhaps 20 million species. Yet, over the last decade, at least 40 to 50 million acres of rain forest have been disappearing each year, destroyed by overpopulation, huge development projects, fuel-wood demands and non-sustainable agricultural practices such as cattle ranching. Today, almost half of the 15 million square kilometers of rain forest that once existed are gone.

By a conservative estimate, some 75,000 plant and animal species have already disappeared from these forests since deforestation began. Some scientists estimate the current extinction toll from rain forests at 17,500 species per year. Given the widespread scale of destruction in the rain forests, one

KEN TAYLOR

STEVE MASLOWSKI

Hulking cowbird hatchling *gulps food from its adoptive yellow warbler parent (on right). Cowbirds are parasites, laying their eggs in the nests of other birds. These birds then feed the huge cowbird young, at the expense of their own. Highways and other development projects endanger deep forest birds by creating openings that are favored by cowbirds and predatory bluejays, crows and raccoons.*

Fringed gentian
(Endangered N.C.)
Probably never common in North Carolina, this lovely wildflower occurs in only three locations in three mountain counties. It is restricted to soil that comes from a very rare rock type in North Carolina. Gentians have been valued for their medicinal properties.

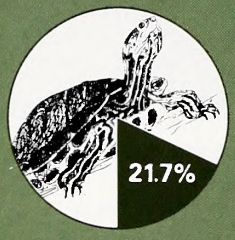
HAL HORWITZ

Vanishing Act

The charts below show the high percentage of North Carolina animal species declared endangered, threatened or of special concern.

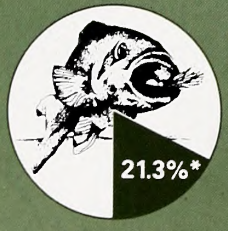
Amphibians

Mammals



Reptiles

Birds



Fish

*proposed

Freshwater & Terrestrial Mollusks

fourth to one half of all species may be extinct or endangered in 25 years.

But extinction and endangerment associated with habitat destruction are hardly confined to the tropics, as the example of the red-cockaded woodpecker shows. Just in the United States, 90 plant species are extinct, with another 11 percent of plant species (about 2,000) plant species endangered or threatened. In North Carolina, over 20 percent of our mammals, amphibians and reptiles have been given some protected status by the state or federal government. Over 20 percent of our freshwater fishes have been proposed as needing protection. Among freshwater mollusks, the tale is worse. A total of 34 percent are proposed as needing protection, a sad commentary on the health of our waterways. We may have lost almost 50 percent of our wetlands—some of North Carolina's most biologically productive lands.

"Not only do we appear ready to lose most if not all tropical forests, but there is also progressive depletion of coral reefs, wetlands, estuaries, and other biotopes of exceptional diversity," writes Norman Meyers, a British scientist. "These environments served in the past as preeminent powerhouses of evolution, in that they have supported the emergence of more species than have other environments."

Which brings us back to our original question: Why should we care? Who would miss the red-cockaded woodpecker? The seabeach amaranth? The Tar River spiny mussel? Extinctions of obscure plants and animals, however pathetic their loss, hardly affect us...or do they?

In defense of species, some argue an ethical point of view: Every species has a right to exist, and we should do everything in our power to preserve the Earth's biological diversity. Environmental moralists also argue that species should be allowed to exist because of their aesthetic value to the world—for the beauty and splendor of the blue whale, the intelligence of the dolphin or gorilla, the elegance of a tropical bird.

Valid arguments, indeed, but they are only sand-castle ramparts in a world stalked by bulldozers and chain saws. In developing nations, millions of people face starvation on a daily basis. The "rights" of animals or species are, for the most part, values held most dearly in the well-fed, rich western nations of the northern hemisphere. A starving villager in India sees a Bengal tiger preserve only as land where he could be growing crops to feed his hungry family, not a place where biotic diversity should be maintained. Even in a land as fat as America, endangered species lose out daily in the quest for economic betterment.

Perhaps more compelling than the ethical argument is the utilitarian argument—we should care about species because they are useful to us. Wild plants and animals perform many functions vital to man's existence on Earth. They provide food, medicines, raw materials; they control floods, maintain atmosphere, and enrich the soil. From this point of view, mankind's preservation of sustained biotic diversity is crucial to our survival on Earth.

An excellent example of a clear and direct benefit that wild species provide is medicines. Over 40 percent of pharmaceuticals sold in America contain chemicals derived from wild species. About 25 percent of these drugs have been derived from plants, another 12 percent come from fungi and bacteria, while 6 percent have been developed from animal sources. For instance, *Digitalis* (or foxglove) is a plant in the snapdragon family that kills or sickens

animals that graze upon it. However, scientists have refined a drug from *Digitalis* which is used to treat chronic heart failure. Countless lives have been saved. And where would the world be without the miracle drug penicillin, an antibiotic derived from mold?

Man, however, has only barely begun to tap the medicinal benefits that plant and animal species could provide us. For instance, only about 10 percent of the estimated known 250,000 flowering plant species have been superficially screened for potential anti-cancer drugs. What as-yet-unknown or untested species in a tropical rain forest may hold the cure for cancer, multiple sclerosis or AIDS? Sadly, because of tropical deforestation and massive species extinction, we may have already lost that benefit.

Other wild plants hold promise of becoming staple food crops, perhaps being cultivatable where standard cereal crops like rice, corn or wheat cannot grow. Appropriate husbandry could lead to other tropical plants, trees and animals being utilized on a sustainable basis.

Preserving genetic variability — both in wild and in domesticated plants — is vital to the continued survival of Mankind. Humanity is dependent on relatively few crop plants — corn, wheat, rice and such. Should a blight strike these crops — such as the infamous Irish potato famine of the 19th century — widescale crop failure and famine could result unless different genetic strains were isolated to give the affected crops genetic resistance to the afflicting disease. Every time a wild relative to a domesticated crop is lost, the storehouse of genetic resistance is depleted.

Even more disturbing, according to scientist Paul Ehrlich, is that the current extinction spasm may threaten interconnected webs of life on Earth.

The structure of ecosystems is generally pyramidal: lots of microorganisms at the bottom supporting fewer plants, which support fewer herbivores. At the top are still fewer predators. Some species, known as keystone species, are so important that they anchor entire ecosystems. If a keystone species is removed, the entire structure can collapse. For instance, if a predator is removed (and man does not take its place), then the herbivore population can expand beyond the carrying capacity of the land, thereby depleting vegetation and eventually causing mass starvation and disease among the overpopulated herbivores.

A good example of a keystone species is Florida's gopher tortoise, a burrow-digging land turtle whose habitat is the longleaf pine forest and whose burrows are also used by 100 animal species. In North Carolina, the red-cockaded woodpecker is considered a keystone species — at least on a small scale. By excavating cavities in living trees, it also provides habitat for other cavity-seeking species such as flying squirrels and great crested flycatchers. Probably the best example of a keystone species is the beaver, which modifies its habitats so thoroughly that it creates entire wetland systems that provide habitat for vertebrate species and invertebrate species alike — from fish and frogs to mink, waterfowl and wading birds.

Ehrlich likens Man's present extinction of species to popping rivets on an airplane. One can pop several rivets without the wings falling off, but if a crucial one is removed, catastrophe results. Similarly, we can function without some species, but if too many are removed, ecosystems may stop functioning in predictable ways.

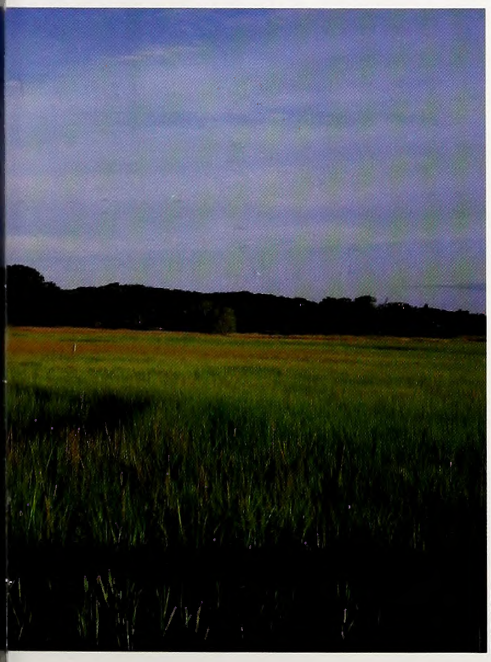
Will Man's continued rivet-popping — the destruction of habitat, including the vital tropical rain forests as one example — eventually cause a global food chain collapse? Or perhaps trigger changes in weather patterns that may induce global warming and attendant sea level rises and crop failures? Predicting if and when these events might happen may well be impossible. But once they have happened, it may be equally impossible to control their consequences.

We may not have to wait long to find out. During the first 25 years of the 21st century, the Earth may begin experiencing major climate changes associated with the greenhouse effect, resulting from a buildup of carbon dioxide and other greenhouse gases that trap heat in the earth's atmosphere. Some argue that we are already experiencing symptoms of the greenhouse effect because of the destruction of the oxygen-producing and carbon dioxide-absorbing rain forests. If these trends continue to the end of the next century, "humanity will bring upon itself consequences depressingly similar to those expected from a nuclear winter" laments Ehrlich in his book *Extinction*.

For us — if not many of the Earth's hapless creatures — there may be time to choose our ground, to halt the spiral towards mass oblivion. We'd better choose our stopping points carefully, for today's "middle ground" may be tomorrow's precipice. By then, it may not take much to push us all over the edge. ☒

***Volunteers aid** this loggerhead sea turtle as she lays her eggs on Sunset Beach. Hatched young are often disoriented by bright lights and deep tire ruts. Behavior evolved over millions of years today brings the loggerhead into sharp conflict with skyrocketing coastal development (right).*

KEN TAYLOR



KEN TAYLOR

***Wetlands such as this** coastal salt marsh are among the most productive habitats in the state. Wetland drainage for crops or pine plantations, or for urban or coastal development, has put pressure on scores of plants and animals.*

KEN TAYLOR

© ROBERT RATTNER

Manatee
(Endangered U.S., N.C.)
Mother and young swim slowly in shallow coastal waters. At the northern edge of its range in North Carolina, the manatee was never very common here. Its population in North America has dropped to only about 1,000. Boat collisions and other human-related activities have been blamed for its decline.

Weapons Against Extinction

These laws are the best hope for endangered species, and we're lucky to have them. Here's what they do... and don't do.

by Garnet Bass

After 400 or so years of "taming" the continent, Americans did a remarkable thing in 1966. They adopted the first of a series of laws and amendments designed to save some of the wild things they had been destroying. These actions culminated in what today has been called the most powerful endangered species protection in the world.

Most states, including North Carolina, have since followed suit with their own laws and programs to protect locally endangered species. Roger DiSilvestro, a longtime *Audubon* writer, looked specifically at the federal law in his book *The Endangered Kingdom*, but his comments could apply to state efforts as well. He wrote:

"[The Endangered Species Act] shows that there are among us people who cannot look upon a suffering or dying thing, or a vanishing species, without a pang of regret or sorrow... The Endangered Species Act thus shows that there is hope for human survival. If people such as these can ever dominate the actions of society, then perhaps the actions of society will cease to threaten the survival of all life."

DiSilvestro called species protection simultaneously optimistic and unpragmatic. It is also complex.

What laws protect endangered species, and when were they passed?

The primary federal protection comes from the Endangered Species Act of 1973, with amendments enacted in '78, '82, and '88. Officially it's known as 16 U.S.C. 1531 to 1543. The Act's precedents go back only to 1966. Endangered species receive additional protection under separate state statutes for plants and animals in North Carolina. The plant law (N.C. General Statutes 106-202.12 to 106-202.19) dates to 1979. Wildlife protection falls under G.S. 113-331 to 113-337, adopted in 1987.

Who is responsible for administering and enforcing the laws?

At the federal level, the responsibility falls primarily on the Interior Department's U.S. Fish and Wildlife Service for terrestrial and inland species (the vast bulk of the federal program) and the Commerce Department's National Marine Fisheries Service for marine species. The Department of Agriculture assists with import/export inspections.

In North Carolina, plant protection is the responsibility of the Plant Conservation Program of the N.C. Department of Agriculture. Animals come under the Nongame and Endangered Species Program of the N.C. Wildlife Resources Commission.

What is a "listed" species?

It means that a plant or animal has been named to either the state or federal list of endangered and threatened species, or to both. Placing a species on one of these lists sets in motion the laws' conservation measures.

How does an endangered species differ from a threatened species?

Basically, a species is **endangered** if it verges on extinction in all or a significant portion of its range. **Threatened** means that it could become endangered in the foreseeable future. State and federal laws also list species under other categories. **Proposed** species are those for which legal notice has been given of the intention to list as endangered or threatened, but for which the process has yet to be completed. You may also hear mention of **candidate** species for either state or federal lists. These are species under study to see whether they qualify for listing. Federal candidates are broken down into two further categories: Candidate 1, meaning all the necessary information is in hand and indicates listing is justified; and Candidate 2, meaning the species needs more study but looks likely for listing. State laws include a section for **species of special concern**. These are animals such as the black skimmer or plants such as ginseng (*Panax quinquefolius*) that require monitoring.

One other difference lies in the definition of eligible animals. Except for those occurring on the federal list, state law excludes game, furbearing animals, and marine creatures from consideration as endangered or threatened species. The state Division of Marine Fisheries is charged with protecting federally listed animals, such as sea turtles, but has no authority to create its own list of species for protection.

How does a species get listed?

The federal process is extremely complicated, covering 600 pages of instructions and taking up to two years even for species that unquestionably deserve protection. After numerous studies, reviews, and sometimes public hearings, the final decision on listing rests with the U.S. Secretary of the Interior for inland species and the U.S. Secretary of Commerce for marine creatures. By law, decisions on federal listings may take only scientific evidence into consideration.

JACK DERMID

Pine barrens tree frog
(Not listed)
Once declared a threatened species nationwide, this amphibian was dropped from the list when other populations were located. The ultimate goal for an endangered species is to be removed from the list when the population recovers.

State listings also require multistep procedures, with scientific evidence alone considered at the first level. Economics may be added into the equation later on. Final listing authority rests with the Plant Conservation Board and the Wildlife Commission.

How many species are on the lists?

The federal list includes approximately 575 domestic and 510 foreign threatened and endangered species. Candidates include another 600 known and 3,000 probable threatened or endangered species.

The state plant list now covers 104 species, with about 175 candidates for listing. So far, 79 animals have been listed, mostly mammals, birds, reptiles, and amphibians. Roughly 115 fish and mollusks have been proposed. Evaluations are just beginning on crustaceans.

How different are the state and federal lists?

The state lists automatically include all federally listed species that occur in North Carolina (30 animals and 30 plants), but they are not limited to those species. In fact, many state-listed species are now candidates for federal listing. Some of the differences occur because of the way the categories are set up; others, because the federal listing process is much more arduous. Finally, some species may be rare in North Carolina but common elsewhere. For example, *Camassia scilloides*, a wild hyacinth found along Roanoke River, is listed by the state as a threatened species. Only a few isolated populations of this species may remain at high elevations or on north-facing slopes in North Carolina, but in colder climates farther north it occurs with more frequency.

Do the lists ever change?

Frequently, and that's good. The lists are designed to be dynamic, with species being added, removed, upgraded, or downgraded as their status changes or as more information becomes available. Furthermore, the ultimate goal of listing is to delist. That is, the laws are supposed to help species recover to the point that they no longer need protection. Although such recoveries remain rare, there are notable examples. The American alligator is one. Hunted nearly to extinction, it was placed on the federal endangered species list in 1966. With that protection, plus state measures that followed, it rebounded. Now its status is rated as threatened, and it remains listed at all only because of its close similarity to the endangered American crocodile.

Once a species is listed, what kind of protection does it receive?

This varies according to whether it receives state or federal protection. In general terms, federal listing means that any project or activity by the federal government, occurring on federal land or in federal waters, or involving federal money or a federal permit should not jeopardize these species by harming them directly or by disturbing their habitat. The law also makes it illegal for anyone to "take" any federally listed animal wherever it occurs, to take any listed plant from areas under federal jurisdiction or to knowingly take a listed plant from any other area. "Take" under the Act means "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any other such conduct." Interstate and international commerce in listed species also are forbidden.

Just as important as what is forbidden are the positive requirements of the Act. Agencies are not only to avoid hurting species but to help them recover using any number of conservation measures. These may include habitat acquisition and scientific studies to further conservation efforts. One additional note: Unlike the federal listing procedure, decisions on conservation measures may include economic considerations.

The state laws also call for conservation, but their restrictions on activities are more limited. Only the taking of listed species is prohibited, and taking under state law means only killing, capturing or pulling up. While animals may not be taken at all, the plant law says merely that you can't take a listed species from another person's property without express permission. You can do anything you want to state-listed plants on your own property.

Are there any gaps in the protection?

Yes. While federal law requires federal agencies to avoid destroying endangered species or their habitats, no such mandate is required of state agencies by the state law. Thus, in late 1990 the state's Hazardous Waste Commission could recommend an incinerator and landfill on a site in Granville County with a highly unusual collection of 11 rare plant species. Among them was the smooth coneflower (*Echinacea laevigata*), a state endangered species and a candidate for federal listing. This gap also enables the N.C. Department of Transportation, arguably the state's largest construction company, to avoid the requirements of the federal Act by using only state money on specific highway projects. "It's hard for them to see the importance of protecting species diversity when you've got a $10 million highway going through a mud hole with a salamander in it," said Randall Wilson, manager of the state Nongame and Endangered Animal Program.

What penalties are involved?

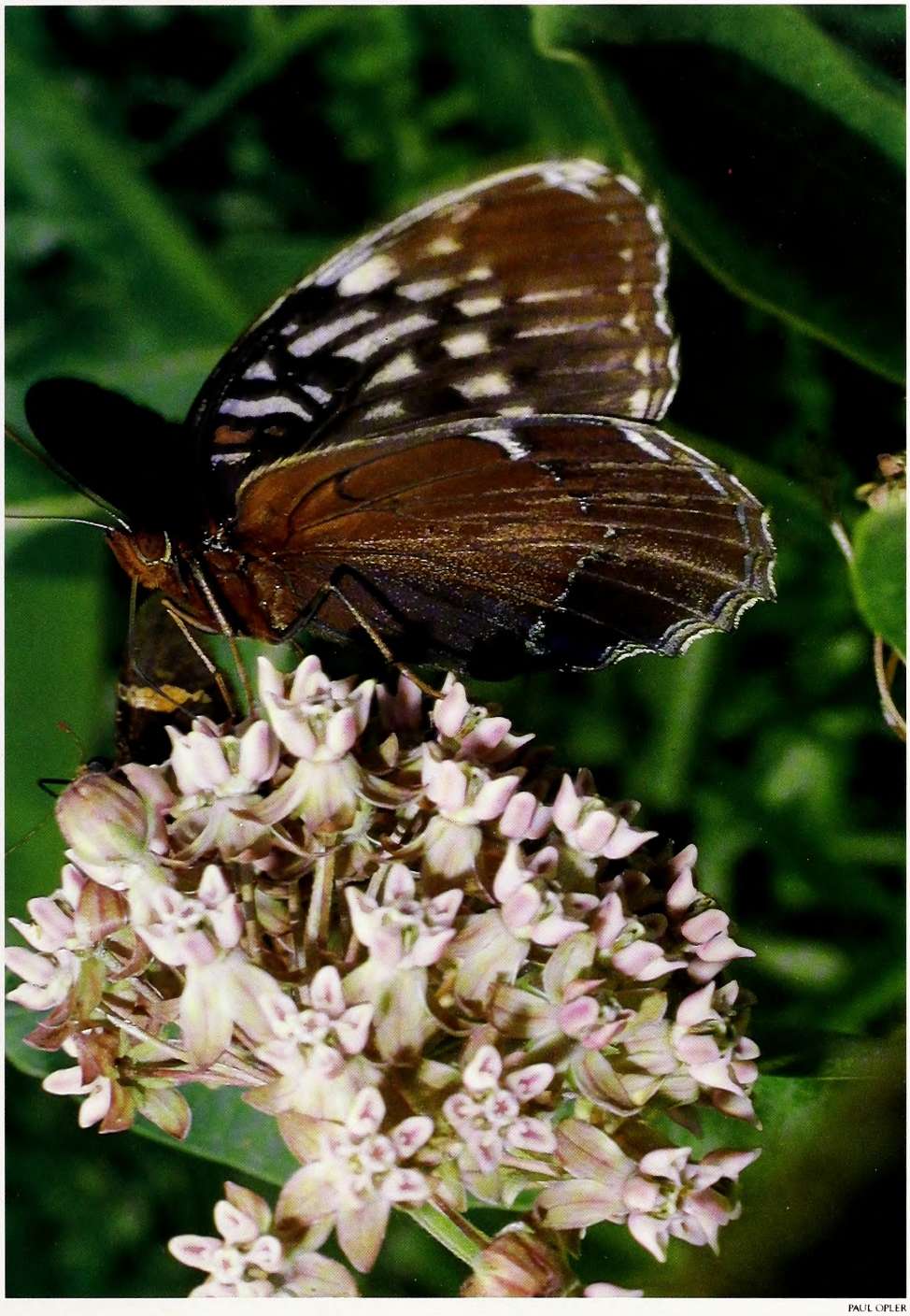
Violations of federal law can result in penalties of up to $50,000 and a year in jail. State violators incur fines of not less than $100 for a first offense and not less than $500 for a subsequent offense.

How much money is spent on these programs?

The U.S. Interior Department allocated approximately $47.7 million to endangered species protection in fiscal 1991, including direct appropriations for administration of the Endangered Species Act plus some other monies for law enforcement, research and fisheries. Congress appropriated another $14.4 million for land acquisition. The Department of Commerce received less than $7 million for its work with marine endangered species. The N.C. Plant Conservation Program operates on about $85,000 annually. The Nongame and Endangered Wildlife Program receives about $450,000 from tax refund checkoffs. Neither state program has received any land-acquisition funds.

We heard a lot of talk last summer about changing the Endangered Species Act. What was that all about?

Two endangered species — the Mount Graham red squirrel and the Colorado squawfish — were holding up construction projects that Interior Secretary Manuel Lujan had pledged to support. In addition, the



PAUL OPLER

Diana
(Not Listed)
This butterfly (Speyeria diana) *is a rare species in North Carolina, but it does not receive any protection. Butterflies and other insects are not protected by the state endangered species law, which only covers mammals, birds, amphibians, reptiles, freshwater fish, mollusks and crustaceans.*

KEN MOORE

Heller's Blazing Star
Threatened (U.S., N.C.)

Federally Listed Plants* in North Carolina

Small-anthered bittercress (E)
(Cardamine micranthera)

Cliff avens (E)
(Geum radiatum)

Swamp pink (T)
(Helonias bullata)

Dwarf-flowered heartleaf (T)
(Hexastylis naniflora)

Mountain bluet (E)
(Houstonia montana)

Mountain golden heather (T)
(Hudsonia montana)

Small whorled pogonia (E)
(Isotria medeoloides)

Heller's blazing star (T)
(Liatris helleri)

Southern spicebush (E)
(Lindera melissifolia)

Rough-leaf loosestrife (E)
(Lysimachia asperulifolia)

Canby's cowbane (E)
(Oxypolis canbyi)

Harperella (E)
(Ptilimnium nodosum)

Michaux's sumac (E)
(Rhus michauxii)

Bunched arrowhead (E)
(Sagittaria fasciculata)

Mountain sweet pitcher plant (E)
(Sarracenia jonesii)

Green pitcher plant (E)
(Sarracenia oreophila)

Blue Ridge goldenrod (T)
(Solidago spithamaea)

Virginia spiraea (T)
(Spiraea virginiana)

Cooley's meadowrue (E)
(Thalictrum cooleyi)

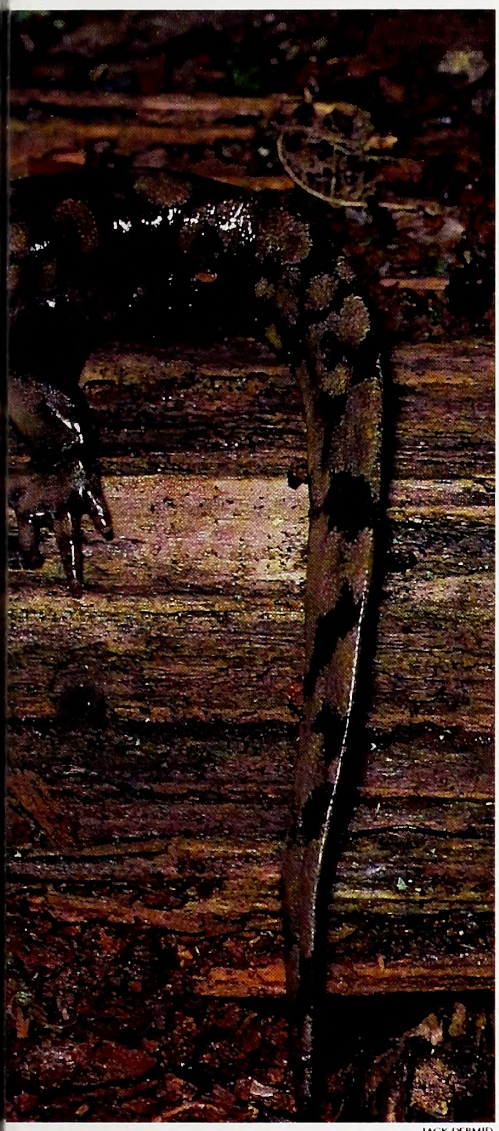
**as of January 1991*
E = Endangered T = Threatened

Eastern tiger salamander
(Threatened, N.C.)
Many amphibians like the tiger salamander require wetlands for their breeding activities. Wetland drainage imperils these species.

threatened Pacific Northwest spotted owl was itself threatening to limit logging in federally owned old-growth forests. These cases, Lujan said in public statements, proved the Endangered Species Act was "too tough" and should be amended to make it easier for economic considerations to outweigh the survival of a species. He also wanted to foreclose court challenges to executive branch decisions. The secretary has since given up on efforts to weaken the law. "It's apparently been determined that what we have is the best that can be had," said Interior Department spokesman Tom Wilson.

Is the law safe from political pressure now?

No. Here's what Michael Bean, an attorney with the Environmental Defense Fund and chairman of EDF's wildlife committee, said on the subject: "There are clearly storm clouds on the horizon in the form of major controversies over spotted owls and timber harvesting in the Northwest, sea turtles and shrimp fishing in the Southeast, and perhaps even some western water development



JACK DERMID

projects and western fishes. These various conflicts in various regions seem to be fueling an effort within Congress to consider the Endangered Species Act afresh.

I think that in the coming Congress, in 1991 or perhaps 1992, there will probably be a serious effort to weaken the Endangered Species Act by people not supportive of its aims or who would like to ensure that it doesn't hinder or impede those economic or other interests they think are paramount."

What are other limitations to the effectiveness of state or federal endangered species protection programs?

Mostly money, or the lack thereof. At the federal level, an internal audit by the Interior Department, released in October 1990, severely criticized management of the Endangered Species Program. It cited the backlog of 3,600 candidate species and identified 34 species — including the Carolina elktoe, a mussel native to the Charlotte area — that had become extinct in the last decade while waiting to be listed. *Science* magazine in 1988 put the figure even higher, at 80 to 250 species lost before listing and thus before any federal protection could be extended.

Furthermore, recovery plans have been drawn up for only half of all the domestic listed species, and many of the existing plans — such as that for the Tar River spiny mussel (*Elliptio steinstansana*), the state's most critically endangered animal — are in such early stages that they're primarily outlines for necessary research. The listing backlog causes further problems for recovery plans, said Bean of EDF. "Many (species) are in a much more precarious situation today than when they were first identified as needing protection 14 years ago," he said. "A consequence is that by the time a species is listed, many of the options to conserve it have been lost, including many of the cheaper options."

The primary reason for this backlog, according to the audit and knowledgeable observers? Lack of money. The program's mission overwhelms available funds. According to one estimate cited in the audit report, the program needs $4.5 billion just to catch up.

The state programs, both of which have duties in addition to protecting rare species, face similar problems. The animal protection program has three field biologists, a field superintendent, the manager, and a clerical worker. That represents one fourth of what Randall Wilson says is needed, and he doesn't foresee more money coming in. Receipts under the tax refund checkoff program have started to level off, a pattern that other states with the same funding mechanism also have experienced, he said.

Cecil Frost, director of the Plant Conservation Program, has modest aspirations. The program currently supports himself and a half-time biologist. He'd like to bring that up to three full-time people. "It's amazing what you can do in the field with just a few people," he said. That's because plants stay put and are easier to manage than animals. Also, most of the 104 protected plants in the state are on public lands and are threatened by a single cause — the loss of occasional fires that rejuvenate their habitat.

The future promises to be difficult for endangered and threatened species. Examining progress so far, Dick Biggins, an endangered species biologist with the Fish and Wildlife Service's regional office in Asheville, said, "Overall, our success has been minimal... Recovery is a very difficult thing to reach." As humans expand to take over more and more of the planet, the pressure on other species of all shapes and sizes and life-forms will increase. Knowing this, we can only redouble our efforts. For in these efforts, as Roger DiSilvestro notes, lies our hope for the survival of all life. ⊠

KEN TAYLOR

Northern flying squirrel

Federally Listed Animals* in North Carolina

Mammals
Red wolf (E)
Eastern cougar (E)
Northern flying squirrel (E)
Gray bat (E)
Indiana bat (E)
Virginia big-eared bat (E)
Florida manatee (E)
Dismal Swamp southeastern shrew (T)

Birds
American eastern peregrine falcon (E)
Arctic peregrine falcon (T)
Bachman's warbler (E)
Ivory-billed woodpecker (E)
Kirtland's warbler (E)
Piping plover (T)
Red-cockaded woodpecker (E)
Roseate tern (E)
Bald eagle (E)
Wood stork (T)

Reptiles
American alligator (T)**
Green turtle (T)
Hawksbill (Atlantic) turtle (E)
Kemp's (Atlantic) ridley turtle (E)
Leatherback turtle (E)
Loggerhead turtle (T)

Fishes
Cape Fear shiner (E)
Shortnose sturgeon (E)
Spotfin chub (T)
Waccamaw silverside (T)

Mollusks
Dwarf wedge mussel (E)
Noonday snail (T)
Tar River spiny mussel (E)
Little-wing pearlymussel (E)

**as of January 1991*
E = Endangered T = Threatened

***Though not endangered, the alligator looks enough like another endangered species, the American crocodile, to be protected.*

Going, Going...?

Profiles of a few of the plants and animals found in North Carolina that could soon disappear if efforts to save them fail.

by Lawrence S. Earley

Endangered species aren't all impressive animals, although some are, nor are they always the showiest of wildflowers, although many are surely among the most beautiful. Indeed, among the 42 plant and animal species profiled on these pages , few generalizations can be drawn.

On the basis of size or beauty, for example, Gray's lily (*Lilium grayi*) would win a batch of prizes for its showy orange-red flowers atop a 6-foot stalk, but few hearts beat as wildly for the lowly seabeach amaranth (*Amaranthus pumilus*), a sprawling, dune-hugging plant. The sight of a bald eagle is stirring to many, but few would go out of their way to view the Virginia big-eared bat.

Rarity can be relative, too. Manatees and tiger salamanders are both considered rare in the state today, but the manatee never was common, while the tiger salamander has seen its once-widespread Carolina bay habitats disappear one by one. The eastern spiny softshell turtle, listed by the state as of special concern, comes from a single mountain county (Madison), while the red-cockaded woodpecker, found in declining habitats in numerous Coastal Plain counties, is federally listed as endangered.

Closest to extinction? Several vie for this dubious distinction, but try Michaux's sumac (*Rhus michauxii*), a Coastal Plain shrub, or the Tar River spiny mussel, which is found in only a single watershed in the state. Its population is shrinking daily .

There is one generalization thay may be consistently drawn about the state's endangered species: If a species requires a wetland habitat, it's likely to be in deep trouble. These have been, and continue to be, some of the most threatened habitats in the state. Another commonality that links the plants and animals on these pages is their vulnerability and their need for protection.

N.C. BOTANICAL GARDEN

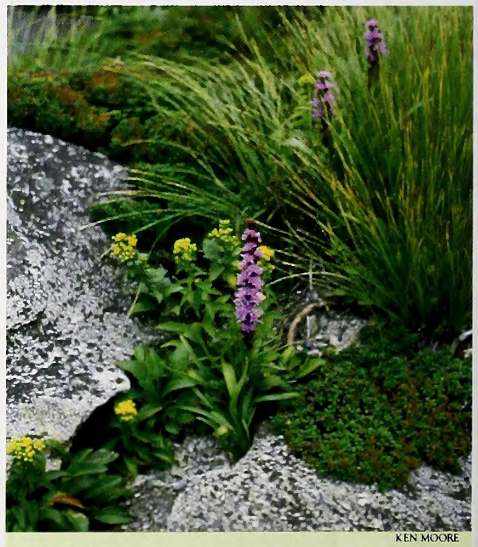
Schweinitz's sunflower (*Helianthus schweinitzii*). Candidate (U.S.), Endangered (N.C.). Tall (up to 15-ft.) prairie type of sunflower that occurs only within 50 miles of Charlotte. Related to western species of the genus, it grew originally in the open Piedmont prairies and post oak savannas maintained by fires and by the grazing of woods bison and other animals. Belongs to the economically important family that contains the sunflower and Jerusalem artichoke. Threatened by urban development.

Virginia spiraea (*Spiraea virginiana*). Threatened (U.S.), Endangered (N.C.). Flowering shrub that can grow up to 6 feet tall. Found in scattered sites along the New River in northwestern North Carolina, and in West Virginia, Virginia and Tennessee. Grows in shrub thickets along mountain rivers. Chief threats: land-disturbing activities in mountain floodplains and alteration of the flooding regime. Native Americans made tea from *Spiraea* species to treat diarrhea, dysentery and morning sickness.

HAL HORWITZ

Swamp pink (*Helonias bullata*). Threatened (U.S., N.C.). Attractive pink flower carried on a tall (up to 3-ft.) stem. Found in the southern mountains, but also grows as far north as New York and south to Georgia. From New York to Virginia it can be found in Coastal Plain bogs; from Virginia to Georgia it grows only in mountain locations. Chief threat is wetland drainage.

Virginia least trillium (*Virginia pusillum* var. *virginianum*). Candidate (U.S.), Endangered (N.C.). A small (up to 4-in.) three-leaved plant with a white flower that turns pink as it ages. Grows in the swamps of Coastal Plain Virginia and in Gates and Currituck counties in northeast North Carolina. Never common in North Carolina. Threatened by wetland drainage and timbering.



KEN MOORE

Heller's blazing star (*Liatris helleri*). Threatened (U.S., N.C.). About 1 foot tall, this wildflower is often found with cliff avens (above) on high mountain rock outcrops in North Carolina, mostly on Grandfather Mountain and in Linville Gorge. Threatened by mountain developments and increased rock climbing.

Michaux's sumac (*Rhus michauxii*). Endangered (U.S., N.C.). Growing up to 2 feet tall, this shrub is in danger of becoming extinct in North Carolina. Historically known in North and South Carolina, Georgia and Florida. Today only about 40 genetic individuals exist in the Sandhills, middle Coastal Plain and Piedmont of North Carolina, and on one small site in Georgia. Threatened by habitat destruction.

Smooth coneflower (*Echinacea laevigata*). Candidate (U.S.), Endangered (N.C.). Cone-shaped disk is surrounded by drooping pink rays supported by a tall (3- to 4-ft.) stalk. Grows in open, prairie-like remnants in Durham and Granville counties, on a soil weathered from a rock type called diabase. Widely cultivated species. Genus was highly valued by Native Americans as medicine, and today it is found in over 200 medical products. Its chief threat is development.

Seabeach amaranth (*Amaranthus pumilus*). Candidate (U.S.), Threatened (N.C.). This annual plant, with pinkish-red stems, spreads low across sand dunes in every coastal county. Once a common plant from Massachusetts to South Carolina, now found only in New York and North and South Carolina. Researchers are investigating the economic potential of the species's large seeds and its salt tolerance. Chief threats: beach development, seawalls.

Cliff avens (*Geum radiatum*). Endangered (U.S., N.C.). Small yellow flowers on stalks 2 feet tall. Occurs only in high mountain locations in North Carolina and Tennessee. Grows on north-facing cliffs exposed to rime ice, frost and snow. Has kin in British Columbia. Threatened by ski developments and rock climbers. Its best populations are on private lands, although most of its populations grow on public land.

Gray's lily (*Lilium grayi*). Candidate (U.S.), Threatened (N.C.). A tall plant on 4- to 6-foot stalks with an attractive orange, bell-shaped flower pollinated by hummingbirds. Grows only in Virginia, Tennessee and the northern mountains of North Carolina. Grows in mountain bogs, grassy balds and high-elevation seepages. Chief threats: drainage of mountain wetlands, collection for wildflower trade.

Sandhills pyxie moss (*Pyxidanthera barbulata* var. *brevifolia*). Endangered (N.C.). A short shrub, and not a moss at all, the pyxie moss is confined to the Sandhills of North and South Carolina. It grows on excessively dry, sandy ridges under longleaf pine. Its white flower blooms from January to March. Ninety percent of its populations are found on Fort Bragg. Threatened by pine straw raking and military vehicles.

Puck's orpine (*Sedum pusillum*). Candidate (U.S.), Endangered (N.C.). This 2-inch succulent is a member of the stonecrop family. It grows in mats or colonies only on granite rock outcrops in Anson County, North Carolina, and south to Georgia. Seeds germinate in winter and by late summer its life cycle is over. Chief threats: trash dumping and off-road vehicles.

Plymouth gentian (*Sabatia kennedyana*). Threatened (N.C.). This showy pink wildflower (up to 2 ft. tall) has one of the strangest distributions of all North Carolina plants. It grows only along the Waccamaw River in Columbus and Brunswick counties, and in adjacent Horry County in South Carolina. But it also occurs on Cape Cod and in Nova Scotia. Chief threats: dredging, floodplain development and sedimentation.

KEN TAYLOR

Mountain sweet pitcher plant (*Sarracenia jonesii*). Endangered (U.S., N.C.). Insectivorous; 2 feet tall. Endemic (restricted) to mountains along border of North and South Carolina. It is related to other pitcher plants that grow in nutrient-poor soils in the Coastal Plain of the Southeast. Historically known in 18 locations, today found in only four. Threatened by drainage of mountain wetlands and illegal collection.

Small-anthered bittercress (*Cardamine micranthera*). Endangered (U.S., N.C.). Rediscovered in 1985 after it was believed to be extinct, this foot-tall member of the mustard family is known from Stokes County in North Carolina and Patrick County in Virginia. Grows on sandbars, stream banks and seepages. Chief threats: wetland drainage, sedimentation and alteration of water levels.

Yellow fringeless orchid (*Platanthera integra*). Threatened (N.C.). Showy yellow orchid (up to 2 ft. tall). Like the giant spiral orchid (above), it grows in moist longleaf pine savannas and is dependent on frequent fires. Threatened by drainage of savannas, fire suppression and pine plantations.

HAL HORWITZ

Giant spiral orchid (*Spiranthes longilabris*). Candidate (N.C.). Beautiful white orchid (up to 2 ft. tall) in moist longleaf pine savannas. Dependent on frequent fires for blooming. Reduced throughout its southeastern Coastal Plain range. Chief threats: fire suppression, wetland drainage and the conversion of natural pine sites to pine plantations.

Roughleaf loosestrife (*Lysimachia asperulifolia*). Endangered (U.S., N.C.). Yellow, spiked flower grows about 2 feet tall. Endemic to the southern Coastal Plain of North Carolina. The suppression of frequent fires threatened extinction for this plant, but it has shown some recovery. Chief threats: lack of fire and wetland drainage.

ROB SUTTER

Awned meadow beauty (*Rhexia aristosa*). Candidate (U.S.), Threatened (N.C.). Growing 2 - 3 feet tall, this wildflower has showy, pink flowers. Its habitat is shallow, ephemeral ponds — the clay-based Carolina bays of the southern Coastal Plain and the lime sink ponds on Camp Lejeune in Onslow County. Chief threats: destruction of wetlands.

ON THE BRINK

ENDANGERED SPECIES IN NORTH CAROLINA

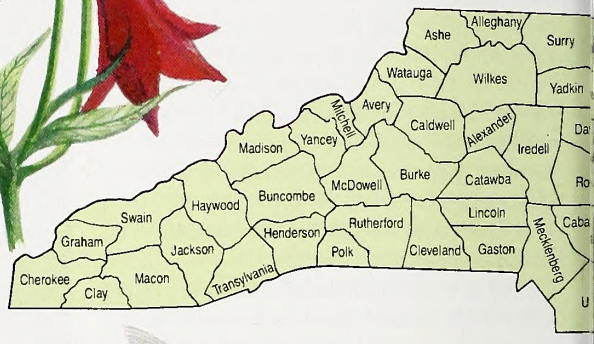
As this sampler shows, endangered species can be found in virtually every region of the state—on coastal dunes, in Carolina bays, in Piedmont streams and on exposed mountain tops. Though they have survived for ages in their communities, today these plants and animals are in jeopardy, threatened by a host of human-caused problems. They are vanishing so swiftly that they have been granted protection under state and federal endangered species laws. Shown here are only some of the scores of plants and animals identified as edging closer to extinction. They are shown with their species names and the location of their habitats.

For information about these species, see pages 14-15, 18-19.

Cliff avens
Geum radiatum
Ashe south to Transylvania counties

Tar River spiny mussel
Elliptio steinstansana
Tar River drainage

Gray's lily
Lilium grayi
Northern mountains



Cape Fear shiner
Notropis mekistocholas
Cape Fear drainage

Northern flying squirrel
Glaucomys sabrinus coloratus
High mountains

Eastern tiger salamander
Ambystoma tigrinum
Hoke, Richmond, Roberson, Scotland

American alligator
Alligator mississippiensis
Coastal Plain

Red-cockaded woodpecker
Picoides borealis
Coastal Plain

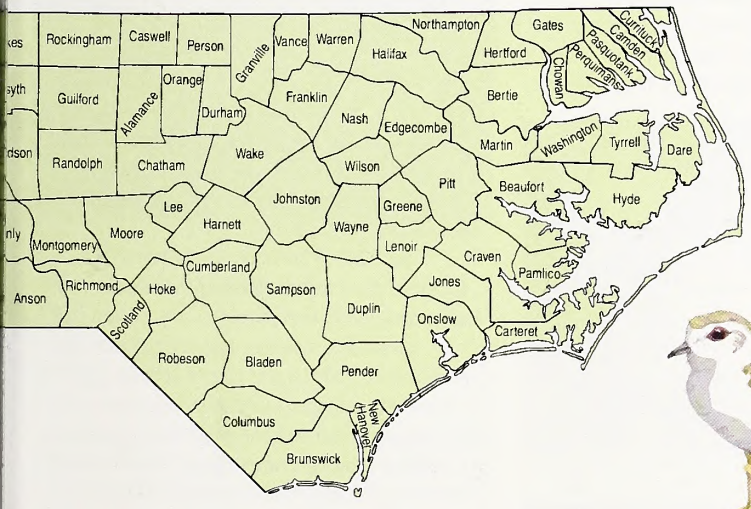
Spotfin chub
Hybopsis monacha
Macon, Swain

Smooth coneflower
Echinacea laevigata
Granville, Durham

Michaux's sumac
Rhus michauxii
Sandhills, Piedmont

Virginia least trillium
Trillium pusillum
Gates, Currituck

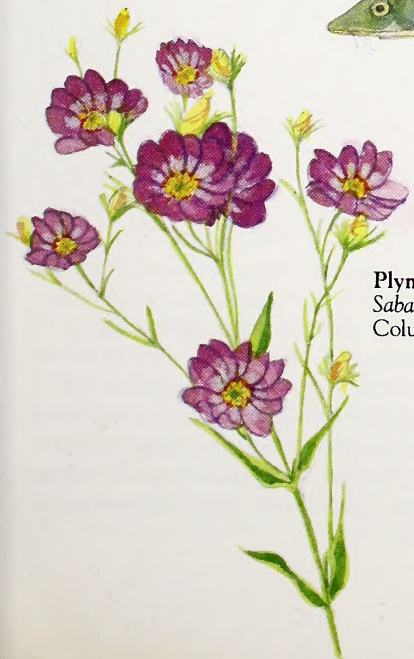
Seabeach amaranth
Amaranthus pumilus
Coastal beaches



Piping plover
Charadrius melodus
Coastal beaches

Rough-leaf loosestrife
Lysimachia asperulifolia
Coastal, sandhills

Shortnose sturgeon
Acipenser brevirostrum
Coastal Plain



Plymouth gentian
Sabatia kennedyana
Columbus, Brunswick

Loggerhead turtle
Caretta caretta
Ocean, sounds

ILLUSTRATED BY JEANNE BEURY

West Indian manatee ***(Trechechus manatus)***. Endangered (U.S., N.C.). An aquatic mammal measuring about 10-13 feet in length and weighing about 1,100 pounds. Its habitat is warm-water, shallow sounds and slow-moving coastal rivers. North Carolina is the northern range of this creature, and sightings are few, although it may be present here more than researchers know. Only 1,000 manatees are known in the United States, and they are vulnerable to a variety of human-caused injuries.

KEN TAYLOR

Peregrine falcon ***(Falco peregrinus)***. Endangered (U.S., N.C.). Grayish, up to 20 inches long. It preys on birds, taking them on the wing at speeds of up to 165 mph. Populations plummeted in the 1960s because the falcons ingested quantities of the toxic chemical DDT in their prey. Beginning in 1984 biologists released captive-reared peregrines in the North Carolina mountains in hopes that pairs would reestablish a breeding range in the state.

Piping plover ***(Charadrius melodus)***. Threatened (U.S., N.C.). This shorebird has a white breast and gray back with a dark band around the neck and another dark line from eye to eye across the head. Nests on sandy coastal beaches and also on natural islands in coastal rivers or islands made from dredged materials. Once widespread, the plover was hunted nearly to extirpation for its feathers. Threatened by coastal development and recreational use of its habitat.

Red-cockaded woodpecker ***(Picoides borealis)***. Endangered (U.S., N.C.). This black-and-white barred woodpecker occurs only in pine forests in the Coastal Plain, mostly longleaf pine forests. It prefers open pine savannas and is unlike other woodpeckers in that it excavates its roosting and nesting cavities in live trees. The destruction of the extensive longleaf pine forests has reduced the numbers of the red-cockaded, and fire suppression has encouraged understory growth, which degrades the open conditions the bird prefers.

Southeastern bald eagle ***(Haliaeetus leucocephalus)***. Endangered (U.S., N.C.). Highly recognizable with its white head, the bald eagle eats mostly fish. Once common in the Coastal Plain, eagles were especially harmed by ingestions of DDT, which caused eggshell thinning. Populations are now on the rise, due partly to the construction of new lakes, and nests have occurred in several locations in the state. Yet the bird is still vulnerable to human encroachment, especially in its preferred waterfront hunting areas.

Shortnose sturgeon ***(Acipenser brevirostrum)***. Endangered (U.S., N.C.). This yellow-brown shortnose sturgeon is covered with bony plates that give it an armored appearance. It ranges along the East Coast from Canada to Florida. It is an anadromous species, meaning it spawns in upriver locations. It eats crustaceans, aquatic insects, mollusks and plants. Chief threat: an overall degradation of upriver areas necessary for spawning and nurseries.

Spotfin chub ***(Hybopsis monacha)***. Threatened (U.S., N.C.). A 2- to 3-inch minnow, the spotfin chub is found only in a few tributaries of the Tennessee River in western North Carolina, Tennessee and Virginia. Its range has been greatly reduced by siltation, pollution, reservoir construction and other development activities.

Tar River spiny mussel ***(Elliptio steinstansana)***. Endangered (U.S., N.C.). A small, clam-like mollusk, the Tar River spiny mussel has several telltale spines on its 2-inch shell, whence it derives its name. Confined to the Tar River drainage, the mussel is one of many freshwater mussel species that are disappearing from North Carolina rivers mostly because of pollution.

KEN TAYLOR

Bog turtle ***(Clemmys muhlenbergii)***. Special concern (N.C.). Our smallest turtle (less than 4½ in. long), the bog turtle is distinguished by orange "blazes" on both sides of its head. It lives at up to 4,500 feet in elevation, mostly in the Blue Ridge Mountain province. It buries itself most of the time in muddy sphagnum bogs. Preyed upon by raccoons, opossums and dogs but also endangered by wetland drainage, development and overcollecting.

KEN TAYLOR

Northern saw-whet owl ***(Aegolius acadicus)***.Special concern (N.C.). Measuring about 8 inches, with a wingspread of 18 inches, the saw-whet is North Carolina's smallest owl and one of its rarest. Occurs at the southern edge of its eastern range in the North Carolina mountains at elevations above 5,000 feet. Concern is due to the steady decline of its spruce-fir forest habitats mainly because of timber removal, pollution, insect attack and climate warming.

Dismal Swamp southeastern shrew ***(Sorex longirostris fisheri)***. Threatened (U.S., N.C.). This subspecies of the southeastern shrew occurs only in the Dismal Swamp of southeastern Virginia and northeastern North Carolina. Its preferred habitats are damp fields, canebrakes and lowland forests. Like other shrews, it eats a variety of snails, slugs, worms and vegetation. Chief threat: ditching and draining of Dismal Swamp .

Northern pine snake ***(Pituophis melanoleucus melanoleucus)***. Special concern (N.C.) This large (up to 6½ ft. long), white-and-brown blotched snake is found mostly in the Sandhills portion of the state, where it is associated with the longleaf pine ecosystem. It also occurs in the southern mountains. Chief threats: loss of longleaf pine habitats and collecting for the pet trade.

American alligator ***(Alligator mississippiensis)***. Threatened (U.S., N.C.). At the northern edge of its range in North Carolina. It is among the most ancient of animals, belonging to the order that includes dinosaurs. It is mostly found in the southeastern portion of the state, in lakes, marshes and other coastal wetlands. The largest alligator found in North Carolina was measured at 12 feet, 7 inches, but it grows larger in warmer locations. Chief threat: drainage of coastal wetlands.

Eastern tiger salamander ***(Ambystoma tigrinum)***. Threatened (N.C.). A large amphibian (7 - 11 in.), the tiger salamander is confined to the edge of the Sandhills — in Robeson, Hoke and Scotland counties. Terrestrial 10 months of the year, it becomes an aquatic species in January and February when it migrates to temporary ponds to breed. The drainage of many Carolina bays has threatened this amphibian throughout its limited North Carolina range.

JAMES F. PARNELL

Virginia big-eared bat ***(Plecotus townsendii virginianus)***. Endangered (U.S., N.C.). This dark brown bat is about 4 inches long, with ears twice as long (1 inch) as any other bat in the state. This subspecies of the more common *Plecotus townsendii* of the West has been located in Avery and Watauga counties in the North Carolina mountains, and in Virginia and West Virginia. Its cave habitats are vulnerable to human disturbance.

JAMES F. PARNELL

Waccamaw silverside ***(Menidia extensa)***. Threatened (U.S., N.C.). This nearly transparent 2 1/2-inch fish has been found in only one place in the world, Lake Waccamaw and the upper Waccamaw River. One of several fish species endemic to that lake. Chief threat: water quality deterioration in the lake because of pollution.

Northern flying squirrel ***(Glaucomys sabrinus coloratus)***. Endangered (U.S., N.C.). Subspecies of the northern flying squirrel that lives far to the north. Found only in scattered mountain locations in North Carolina and Tennessee, although at one time it ranged more widely. Its habitat is mature, open hardwood forests above 5,000 feet. Chief threats: clearcutting, the spread of recreational development, and pollution.

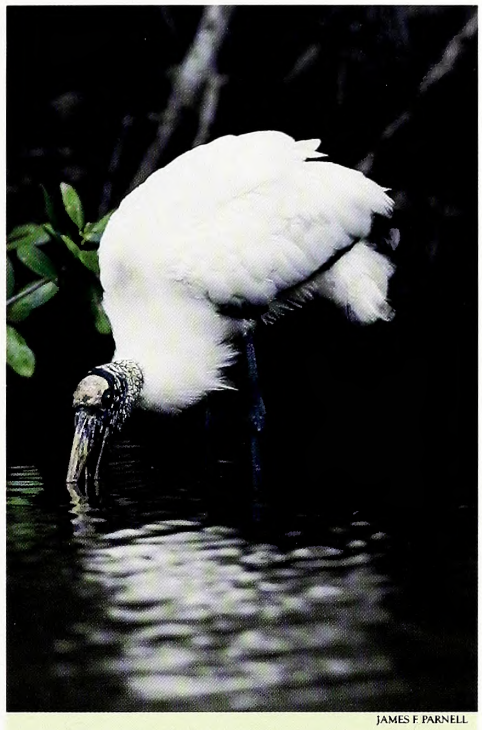
Panther ***(Felis concolor)***. Endangered (U.S., N.C.). Once common in the state, the eastern cougar (also known as the panther) lived in high mountain areas and lowland swamps, feeding mostly on white-tailed deer. Subspecies of this large cat (up to 7½ ft. long and weighing up to 150 pounds) are today still quite common in western states but the eastern cougar is thought to be extinct.

Loggerhead turtle ***(Caretta caretta)***. Threatened (U.S., N.C.). This sea turtle comes to shore in June to lay 100-150 eggs in a cavity about 2 feet deep along the base of the first dunes. In August, the eggs hatch and the hatchlings scramble to the surf. The chief threats to this sea turtle are coastal development and ORV use along the beaches.

U.S. FISH & WILDLIFE SERVICE

Red wolf ***(Canis rufus)***. Endangered (U.S.). This small wolf weighs between 40 and 80 pounds and ranges in color from red to gray. Once a common carnivore along the East Coast up to southern Pennsylvania, the red wolf was considered a varmint and hunted out of North Carolina. In 1986 it was reintroduced to the state in the Alligator River National Wildlife Refuge in Dare County. Chief threats: interbreeding with coyotes and lack of support for recovery program.

Cape Fear shiner ***(Notropis mekistocholas)***. Endangered (U.S., N.C.). A small (2 in.) yellowish fish with a black band along its sides. Only known from four small populations in the Cape Fear River drainage. Three others are apparently extirpated. The fish has probably always been rare, but its existence is threatened today by wastewater discharges, dam construction and sedimentation from development projects in the watershed.



JAMES F. PARNELL

Wood stork ***(Mycteria americana)***. Endangered (U.S., N.C.). These large white birds nest in colonies from South Carolina to Florida, and small numbers of them are regular summer visitors at Sunset Beach in Brunswick County. They do not breed here and are not known to occur elsewhere in the state. They feed in shallow water, sweeping their bills back and forth to catch small fish. Chief threat: loss of habitat.

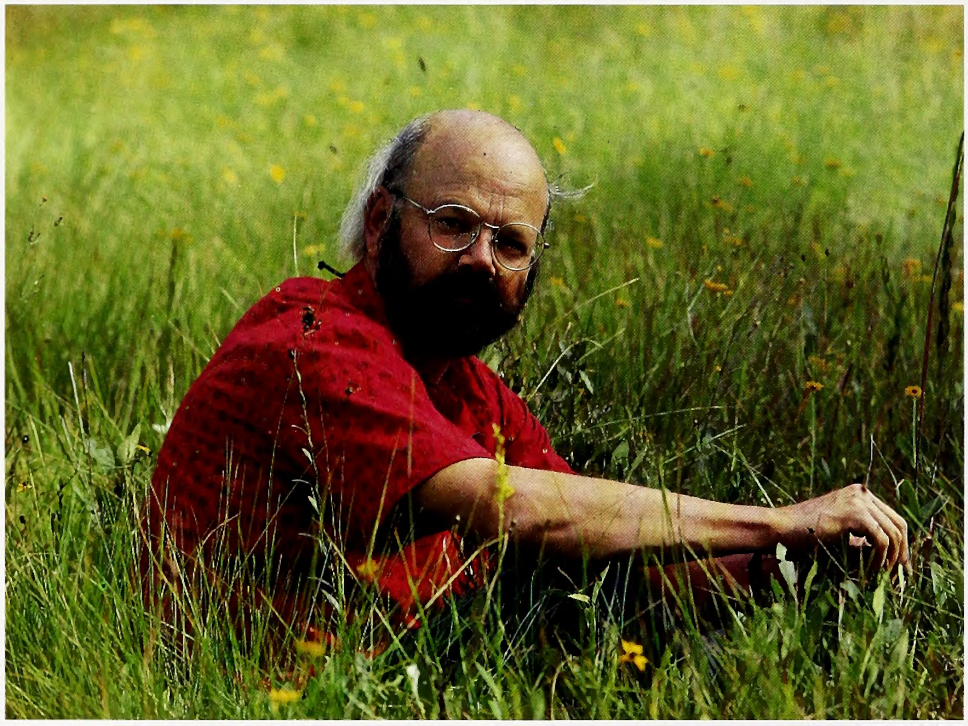
ALVIN BRASWELL

Carolina crawfish frog ***(Rana areolata capito)***. Special concern (N.C.). A medium-sized (2.8-3.7 in.) frog, mostly gray with dark spots. Historically known from about 20 sites in southeastern North Carolina. Like the tiger salamander, the crawfish frog is terrestrial most of the year and then in winter seeks to breed in ponds that are free of fish. Chief threat: loss of terrestrial habitat and especially drainage of breeding ponds. ⊠

The Care Corps

A handful of people hold the key to survival for countless species. Here are a dedicated few who are carrying the flag.

by John Manuel



LAWRENCE S. EARLEY

Cecil Frost *is a biologist with the Plant Conservation Program of the N.C. Department of Agriculture. The Plant Conservation Program performs vital recovery work on some of the state's rare and endangered plant species.*

In the summer of 1987, a hawk circling Roan Mountain in western North Carolina would have seen a dozen people walking abreast over the grassy balds, eyes focused on the ground. Among these people were Alan Weakley of the N.C. Natural Heritage Program, Rob Sutter of the N.C. Plant Conservation Program, Nora Murdock of the U.S. Fish and Wildlife Service, and several representatives of The Nature Conservancy. They were conducting a sweep of the Roan massif on behalf of the U.S. Forest Service to identify and map the rare and endangered plant species growing on Forest Service land.

In the months and years following the sweeps, these people have joined forces many times around conference tables, where they have offered Forest Service personnel suggestions on designing a management plan for the mountain. That so many agencies would contribute time and money for such an undertaking is unusual. That they have worked and continue to work more or less happily together is truly remarkable.

"It must be something in the water," jokes Joe Jacob, science director for The Nature Conservancy's Southeast Regional Office. "The willingness of North Carolina agencies to cooperate with each other is something I don't normally see. It's really a tribute to those who work in these agencies. They are highly professional and highly committed. They recognize that no one program has all the tools and resources needed to save endangered species, but if they work together they can do a good job."

In North Carolina, four state and federal agencies have specific mandates to protect and restore rare and endangered plants and animals. In addition, a private conservation group, The Nature Conservancy, adds its considerable weight to this work. The agency that has worked longest with endangered species is the U.S. Fish and Wildlife Service; its Asheville office serves North Carolina, South Carolina, Tennessee and Kentucky. The Service is the agency responsible for enforcing the Federal Endangered Species Act, passed by Congress in 1973. This law states that all federal agencies must use their authorities to further the conservation of endangered species, and that any time federal money or federal permits are involved in a project that may adversely affect an endangered species, the agency must consult with the Fish and Wildlife Service to seek ways of avoiding these effects.

On Roan Mountain, the Fish and Wildlife Service was called in by the U.S. Forest Service, which was seeking to develop a management plan for the federally owned lands that encompass the mountain. "There are about 20 rare and endangered plant species on Roan Mountain whose fate will be determined by that management plan," says Nora Murdock, director of the Asheville field office. "We were called in to tell the Forest Service what species they have, where they are, and what actions those species might be sensitive to."

One of the problems the Forest Service faces on Roan Mountain is that the grassy

balds are gradually being taken over by blackberry vines. The Forest Service hoped that they could keep the balds clear through their traditional method of burning. However, Murdock has found through a series of test burns that this practice actually increases the growth of blackberry vines.

In cooperation with several other agencies, Fish and Wildlife is now testing several alternatives to burning that include the spraying of herbicides, cutting (meant to imitate grazing by cows), and mowing. The results of these tests will determine what practices are eventually prescribed in the Forest Service's plan for Roan Mountain.

To maximize the use of their funds, the Forest Service offered challenge grants to other agencies willing to help gather data and develop conservation strategies for the Roan massif. The first person to respond was Rob Sutter, who was then director of the Plant Conservation Program (PCP) within the N.C. Department of Agriculture.

"I designed and headed up the sweep as a means of identifying where the endangered plants occur on the mountain," says Sutter. "Following the sweep, I put the data on Mylar overlays of the mountain to help the Forest Service in their planning effort."

Under the auspices of the N.C. Plant Conservation and Protection Act, now headed by Cecil Frost, PCP is legally responsible for the monitoring, surveillance, listing and protection of North Carolina's rare and endangered plant species. Currently, there are 104 plant species on that list, yet PCP has only one full-time staff person. That means the agency must frequently turn to others for help. Most often, the help comes from its sister state agency—the Natural Heritage Program.

North Carolina's Natural Heritage Program was established in 1976 as a branch of the State Parks and Recreation Division within the Department of Natural Resources and Community Development (now the Department of Environment, Health, and Natural Resources). Natural Heritage plays the lead roll in finding and cataloging the state's most significant natural areas—areas that frequently support populations of rare or endangered plants and animals.

Natural Heritage has a full-time staff of four, including a coordinator, protection specialist, botanist and ecologist. This enables the agency to do more fieldwork than the Plant Conservation Program.

"The way the division of labor has worked out, the Natural Heritage Program concentrates mostly on inventory work and PCP does most of the recovery work," says Charles Roe, director of the Natural Heritage Program. "We have a cooperative agreement with PCP whereby we maintain maps and computer files on rare and endangered species and we provide them with once-a-year updates."

KEN TAYLOR

In addition to collecting data, Natural Heritage develops protection priorities for lands that support populations of rare and endangered plants and animals. Where the land in question is privately owned, the agency typically asks the owner to register the property as a Natural Heritage Area. This nonbinding agreement honors the landowner and announces his/her intent to protect the natural qualities of the land. For publicly held lands, Natural Heritage may pursue one of several means of protection, including establishment of cooperative agreements between state and federal agencies, formal registry agreements, or outright acquisition by its partner organization—The Nature Conservancy.

The Nature Conservancy is an international, private, nonprofit organization with field offices in every state and several foreign countries. Its goal is to protect rare and endangered plants and animals by preserving their habitats. The Nature Conservancy provided initial funding for the Natural Heritage Program and continues to work closely with its staff. Aside from being a private organization, what distinguishes The Nature Conservancy from the government agencies working with rare and endangered species is its ability to purchase land.

Since opening its North Carolina field office in 1977, The Nature Conservancy has preserved over 320,000 acres in this state. Most of this land is now managed by public

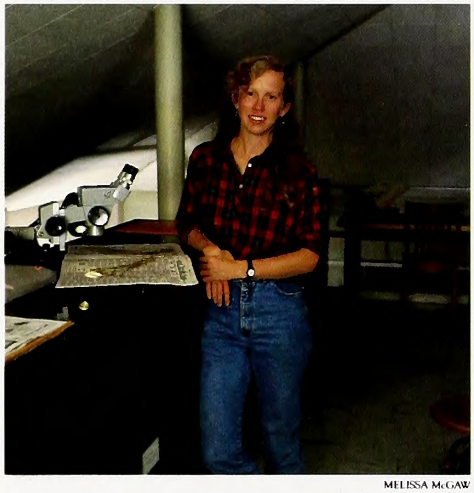
Nora Murdock *is a biologist with the U.S. Fish and Wildlife Service based in Asheville. This federal agency is responsible for enforcing the Endangered Species Act. The Asheville office serves North Carolina, South Carolina, Tennessee and Kentucky.*

Julie Moore *is a botanist with North Carolina's Natural Heritage Program. Natural Heritage plays an important role in locating and cataloging the state's significant natural areas. They also develop strategies for protecting rare and endangered ecological areas and their species.*

KEN TAYLOR

Allen Boynton *is the Mountain Project Leader for the Wildlife Resources Commission's Nongame and Endangered Wildlife Program. Here, he samples the Little Tennessee River for the endangered spotfin chub. The Nongame program is funded by public donations through the state income tax check off.*

KEN TAYLOR



MELISSA McGAW

Susan Wiser, *a graduate student at the University of North Carolina, studies the plant communities of exposed Appalachian mountaintops. These rare plant communities are relicts of the last Ice Age.*

agencies such as the N.C. Wildlife Resources Commission and the Forest Service. The rest is owned and managed by The Nature Conservancy under its system of private nature preserves. More than 90 percent of the conservancy's projects are proposed by the Heritage Program.

Through the management of its preserves, The Nature Conservancy has developed unique experience in fostering the survival of certain rare and endangered plants and animals. That is why the Conservancy was asked to participate in formulating a management plan for the Forest Service lands on Roan Mountain.

"We have maintained a preserve (Big Yellow Mountain) on the Roan massif since 1978," says Carol Mayes, director of stewardship for the North Carolina chapter of The Nature Conservancy. "The previous owners had grazed cattle on the mountain for several generations, which succeeded in keeping the balds open but threatened some of the rare and endangered species.

"By limiting the number of cows on the mountain and the times of year they are up there, we have found we can keep the balds open and still maintain healthy populations of some of these plants."

While not involved in the Roan Mountain operation, the N.C. Wildlife Commission's Nongame and Endangered Species Program plays a vital role in the preservation and restoration of endangered animals. This program was started in 1983 and is funded through a state income tax checkoff and limited federal funds. The staff of five includes a manager and four field biologists.

"Our initial activity centered around data collection and recovery efforts for several federally listed species," says section manager Randall Wilson. "This included protection of sea turtles along the coast, and restoration of peregrine falcons and bald eagles. Since that time, we have moved on to state-listed species, such as the northern flying squirrel, that are also candidates for federal listing."

Wilson says his staff regularly shares data with U.S. Fish and Wildlife and the Natural Heritage Program. In the summer of 1991, for example, the three agencies will work together on a program to study the natural resources of the Sandy Creek/Swift Creek tributary of the Tar River. Previous studies by the Commission revealed that this tributary supports an extremely high biodiversity, including the last known reproducing population of the Tar River spiny mussel. The Heritage Program will survey the plant communities in the watershed, and the Commission will study small mammals, reptiles and amphibians. U.S. Fish and Wildlife will produce a handbook to enable resource managers to instruct neighboring landowners how best to preserve these types of systems.

Although these groups man the front lines of species protection, there are dozens of individuals across the state who work with endangered species. One of them, Jim Keighton, can be found on the third Sunday of every month peering through binoculars across the broad expanse of Jordan Lake, looking for the dark silhouette of a bald eagle. If he sees one of these birds, he waits until it perches, then switches to a tripod-mounted spotting scope for a closer look. He will judge the bird's age by observing its coloration and will record that and the bird's location on a

form and map he keeps at his side. Keighton has been tracking eagles on Jordan Lake since 1985 as part of a monthly bird count sponsored by the New Hope Audubon Society. Nobody pays him; it's not part of any job description.

"I guess you could say I do this out of my love for the eagle and my desire to see it protected," says the 53-year-old education specialist with the North Carolina Museum of Life and Science. "I've been a bald eagle fan from way back. I used to watch them during my summers in northern Minnesota, where I was a schoolteacher."

Keighton isn't the only one who works on his own to protect rare and endangered species. Most do it for the personal enjoyment. But their knowledge is often invaluable to the agencies responsible for protecting these species. In Keighton's case, the data that he and other Audubon Society volunteers have gathered have been used by the Fish and Wildlife Service, the U.S. Army Corps of Engineers, and the Wildlife Commission to develop a management plan for the eagles on Jordan Lake. That plan includes placing voluntary speed limits on boating on parts of the lake where the eagles are known to roost, establishing land-based protection zones, and managing habitat. Keighton has argued for even stronger measures, including the outright banning of motorboats near roosting sites.

"I have very strong feelings for protecting the eagle," Keighton says. "It's not just because they are endangered. Being at the top of the food chain, they are also a barometer for the environment. In both real and symbolic terms, they indicate which direction the country is going."

While Jim Keighton stands on level ground scanning the sky for eagles, Susan Wiser probes the rocky pinnacles of our highest mountains searching for survivors from the last Ice Age. Wiser is a graduate student in biology at the University of North Carolina at Chapel Hill. Her main interest is plant communities that grow on the exposed mountaintops of the Southern Appalachians—communities which include such rarities as Cain's reedgrass, Roan Mountain bluet, and Heller's blazing star.

"You would think that plant communities in the Southern Appalachians have been really well studied," Wiser says. "It's not true... Lots of people have studied the biology of individual plants. Very few people are looking at entire communities."

When she is in the field, Wiser will set up 10-meter by 10-meter plots and measure such variables as degree of slope, elevation and exposure, Then she will make a list of all the plant species growing in a test plot. Later, she will narrow the test area to 4 meters by 4 meters and analyze soil nutrients, soil depth and moisture. "The first step toward protecting a species is gathering these baseline data," she says.

Asked why she is so committed to the preservation of these plant communities, Wiser responds enthusiastically. "I have to admit that part of it is the unique habitat where they occur. These plants have persisted here since the last Ice Age, and I feel they have a right to continue. We need to have a thorough understanding of these areas to understand why some of these species are declining."

If ever a man has had a thorough understanding of an endangered species, it is Jay Carter of Southern Pines. Both on his own and as part of a team of researchers at North Carolina State University, Carter has been studying the red-cockaded woodpecker for the better part of 25 years.

Red-cockaded woodpeckers are a federally endangered species that inhabit the longleaf pine forests of the South. One of the largest populations is found in the North Carolina Sandhills.

"We (the NCSU team) have basically marked every bird in the 400-square-mile Sandhills study area," Carter says. "If you show me the tag, I can tell you how old every one of those birds is, what sex it is, who its mother and father are, and where it was born. It's probably the most intensively studied bird population in the world."

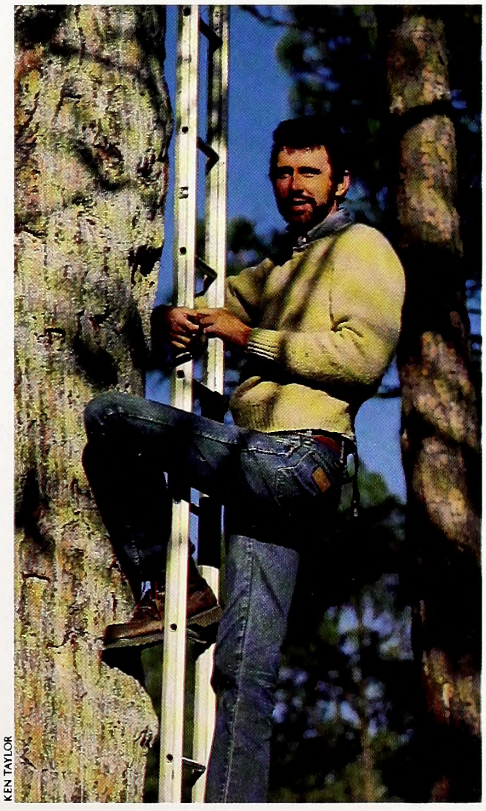
Over the years, Carter has gathered enough information on the species to know exactly what its habitat needs are. As a private consultant, he advises developers and state and federal agencies how to carry out projects with a minimum of disruption to the woodpecker.

"If the land has to be developed, I want to make sure developers incorporate the birds' needs into their management plans," he says. "The woodpecker can get along with people if you meet their minimum habitat requirements. Some of the densest populations are found in residential areas."

Much of the habitat suited to the woodpecker is found on military reservations and land owned by the U.S. Forest Service. Carter says that for these organizations, more birds mean more restrictions on their activities.

"We have the technology and the know-how to dramatically increase populations of the woodpecker, but there are serious political problems in using them," he says. "Unfortunately, no species has ever been removed from the endangered species list where disappearance of habitat was the problem. Time and again, humans have shown that they will give up a lot of things, but they won't give up land. If we could overcome that hurdle, the chances for the bird's survival would be good." ⊠

Jay Carter, *a researcher at North Carolina State University, has spent 25 years studying the red-cockaded woodpecker, a federally listed endangered species. Carter and the NCSU research team have intensively studied the woodpecker populations in the sandhills region of the state.*



KEN TAYLOR

VANISHING LANDSCAPES

You can't save plants and animals unless you protect their habitats. These five habitats in North Carolina are poised on the brink.

KEN TAYLOR

Stately and majestic, *this stand of ancient cypress keeps a silent vigil on the Black River. Loggers cut most old-growth cypress years ago, but these Black River stands contain trees almost 2,000 years old, the oldest trees east of the Rockies.*

by Eddie Nickens

John Muir knew it. Aldo Leopold knew it. Rachel Carson knew it. Every leading thinker and doer of the conservationist movement knew it. And despite the current turf wars between factions of the environmental movement (pro-fur vs. anti-fur), we know it now, deep in the bottom of our pigeon-holed hearts. Nothing—*nothing*—matters as much as habitat.

The purest rain won't grow crabgrass on asphalt. The cleanest air won't sustain wildlife that has nowhere to live.

To preserve species, animal or plant, endangered or not endangered, we *must* preserve habitat. And we must preserve not only its boundaries and appearance, but also its functions. A mountain stream may run clear of silt and unimpeded, but if fouled by pollution upstream, it no longer functions as a mountain stream. Vegetation disappears, insects die, trout starve.

Like plants and animals, habitat can be threatened. In North Carolina, a handful of habitat types face an uncertain future. From tiny mountain bogs to once-vast longleaf pine forests to ecosystems dependent on Piedmont freshwater creeks, five specific habitat types in our state are as endangered as the red-cockaded woodpecker, the mountain bog turtle and a mollusk known as the Carolina heelsplitter. It should come as no surprise that those animals depend totally on these specific habitat types.

The forces that formed the biology and topography of the Old North State can't be blamed for a lack of imagination. The N.C. Natural Heritage Program has identified 114 specific natural communities in our state, each "an entity in its own right," says ecologist Mike Schafale, "not just a home for animals, but a reservoir of ecological information on how organisms interact just as each species is a reservoir of biological information."

The sheer variety of habitats is one reason why habitat protection is such an intricate undertaking in this state. But that variety is also what makes habitat protection so important. It's like the story of the farmer who was visited by a biologist looking for an endangered plant species. The farmer couldn't understand why all the fuss was being made over a flower few could even identify. The biologist asked him, "If you found an odd bolt in your barn, would you throw it away?" "Of course not," replied the farmer. "I might need it someday." And that, says the biologist, is how we feel about the wildflower.

Appalachian bogs *were probably never plentiful and the remaining bogs are under increasing pressure as unfettered development booms in the mountain region. The bogs contain some of the state's rarest species, including the state-listed bog turtle.*

True enough, we might someday need the plants and animals that need these endangered habitats to survive. Saving one of these five endangered North Carolina habitats from destruction might well be training useful for saving the human race from a similar fate.

Mountain Bogs

Saving a mountain bog is certainly no easy task; finding one is difficult enough. Since 1985 biologists Alan Weakley and Alan Smith have been traipsing across the Southern Appalachians looking for northern and southern subtypes of the Southern Appalachian mountain bog.

What they look for are wet, open or shrub-dominated pockets in mountain forest, underlain by mats of *Sphagnum* moss that provide only fragile footing and protection from thick mucky soil below. Those acidic soils are full of decaying vegetation, and they host communities of plant life that could only be found in a mountain bog. Signposts to mountain bogs

KEN TAYLOR

***The peaceful beauty** of the Eno River belies what is happening to the water quality of many Piedmont rivers. Freshwater mollusks are fast disappearing from most of them, a probable indicator that water quality is declining. Many mollusks are now found only in the headwaters or tiny tributaries of Piedmont waterways.*

include cinnamon fern (*Osmunda cinnamomea*) and the insectivorous sundew (*Drosera rotundifolia*). If cranberry (*Vaccinium macrocarpon*) is present, it suggests the area is an example of the northern subtype of mountain bog. Smooth azalea (*Rhododendron arborescens*) is an indicator of the southern subtype.

But Weakley and Smith count themselves lucky no matter which type of bog they bushwhack into. Biologists know little about the dynamics of mountain bogs, but they do know these smallish (up to 60 acres, but generally only an acre or two) microhabitats host some of the state's rarest, and certainly most interesting, plants and animals. And they are disappearing nearly as fast as we can find them.

A species list of the mountain bogs reads like a short Who's Who of rare and endangered species. There are two endangered species of pitcher plant, the mountain sweet pitcher plant (*Sarracenia jonesii*) and the green pitcher plant (*Sarracenia oreophila*), plus the rare Gray's lily (*Lilium grayi*), a candidate species on the state and federal lists. North Carolina's smallest turtle is there, the bog turtle, considered by some naturalists the country's rarest turtle species.

The long-term health of those endangered species depends on the health of the endangered bogs themselves, and on that score there is more than a little cause for concern. While natural succession can be counted as a threat to the maintenance of the bogs, drainage for agriculture and destruction by development rank as the bogs' greatest unnatural enemies. Our mountain bogs are concentrated in a band that runs from Henderson County west to Clay County in the southern mountains, and in Avery, Watauga, Ashe and Allegheny counties in

the northern mountains. Those areas are under increasing development pressure.

Some bogs contain peat soil estimated to be 11,000 years old, but it's anybody's guess whether they will survive even another hundred years.

Diabase Glades

If the mountain bogs seem tiny, consider the plight of the diabase glade. There are only two known intact and undisturbed diabase glades left in the world: one near Rock Hill, South Carolina, and the other in the southwestern corner of North Carolina's Granville County. Comprised of a mere 6 acres, the South Butner Diabase Glade some 10 miles northeast of Durham is virtually all that is left of an open prairie ecosystem that once might have dotted the Piedmont landscape.

Few people have ever heard of diabase glades, and that's not just because they are so few, small and far between. These peculiar ecosystems are a mosaic of herb, shrub and stunted tree patches, found only on broad, flat upland Piedmont ridges. Basic hardwood forests give way to open patches of short vegetation, with small islands of stunted Virginia red cedar (*Juniperus virginiana*) and Georgia hackberry (*Celtis tenuifolia*). The diabase glades host plant species that are more commonly associated with open prairie habitats. It is suspected that natural fires helped maintain the open patches of diabase glades until the present era.

Conditions that produce diabase glades, says Mike Schafale, are extremely rare. The soils of the glades are formed of diabase rock, which decomposes to form a very shallow layer of soil that covers an impenetrable layer of rock or clay. Water may sit on the surface in winter, but in summer the shallow soil is bone dry, without the deeper moisture reserves available in most soils. A cycle of saturation and dehydration saps the strength of most common species. Not much can live there, but what does forms its own little habitat type, apart from the encroaching forest.

The diabase rock that forms the glade soil is related to the basalt that makes up the ocean floor worldwide. Endangered or threatened plant species indigenous to diabase glades are a far cry from seaweed, however. Serpentine aster (*Aster depauperatus*), a low bushy herb, is extremely rare in the state and endangered globally — it occurs in fewer than 20 places in the world. Blue wild indigo (*Baptisia australis*) is more globally secure but still can be found in less than 20 North Carolina locales, while Small's portulaca (*Portulaca smallii*) is confined to sites in the Southeast.

Botanists discovered the South Butner site just in time — a proposed housing development would have destroyed a lot of it. The glade was protected, but much of the surrounding area still remains slated for development and it remains to be seen whether the glade community can survive the increasing numbers of people and houses. As the community gets nibbled away, botanists worry about the consequences of its increasing isolation, consequences that include the loss of its plant and animal species.

CECIL FROST

This diabase glade *in Granville County is perhaps the state's rarest ecosystem. Remnants of an open prairie ecosystem once found in the Piedmont, only two undisturbed diabase glades are left in the world, one of which is this Picture Creek site. At left, the blue wild indigo* (Baptisia australis) *is one of the glades' rare plant species.*

Longleaf Pine Forests

In 1700 John Lawson organized an expedition to explore the backcountry of the

CECIL FROST

Only a few virgin longleaf *pine trees remain in the state and second-growth forest sites have been reduced to a few scattered remnants such as this stand in the Croatan National Forest. Longleaf pine forests are natural treasure troves, containing more than 60 rare and endangered animal and plant species.*

North Carolina wilderness. So taken was he with the great longleaf pine forests that he called the pine "the most useful Tree in the woods." It provided the "four great Necessaries: Pitch, Tar, Rozin, and Turpentine," he wrote. The tall longleaf pines were used for masts, yards and lumber. Before the white man's arrival, an estimated 10 million acres of longleaf pine *(Pinus palustris)* forest covered the eastern third of North Carolina, growing in an unbroken pine forest that blanketed the Coastal Plain from southern Virginia to east Texas.

No more. By the early 20th century most tracts of virgin longleaf — North Carolina's official state tree — had been logged by timbermen and exhausted by turpentiners. The frequent fires that once suppressed the fast-growing loblolly pine competitors are now quickly extinguished. The vast stands of longleaf pine forest, with their high canopies and savanna-like understory meadows of wiregrass, exist in memory alone. Today only remnant populations of second-growth longleaf pine forest remain, scattered across the Fort Bragg Military Reservation, the Sandhills Game Land and the Croatan National Forest. In Weymouth Woods a single stand of old-growth longleaf pine remains. The 250- to 400-year-old pines there are slowly being squeezed out of existence by hardwoods.

In these longleaf pine forests, however, exist more than 60 rare and endangered animal and plant species. The large fox squirrel can be found there, and the endangered red-cockaded woodpecker, which depends for survival on nesting cavities in old longleaf pines. The rare Venus flytrap *(Dionaea muscipula)* is there, as are the federally listed rough-leaf loosestrife *(Lysimachia asperulifolia)* and state-listed Sandhills pyxie-moss *(Pyxidanthera barbulata* var. *brevifolia)*.

Today, controlled burning helps maintain the open character of some remaining second-growth longleaf pine forests, but threats to the long-term future of the forests remain. Outright destruction of the forests heads the list, says Jay Carter, a long-time pines researcher, but even protection from logging or cutting doesn't guarantee survival for a pine stand. The natural fire cycle must be emulated by forest managers, control-burning the understory every two to three years. "Setting these lands aside and leaving them alone is inviting certain long-term destruction," Carter says. And even minimal disturbance of the fragile soils can have significant impacts. A vehicle driven over the same route just a few times can leave a trail that will show up on aerial surveys for a hundred years, Carter says.

The future of these remnant forests is precarious today.

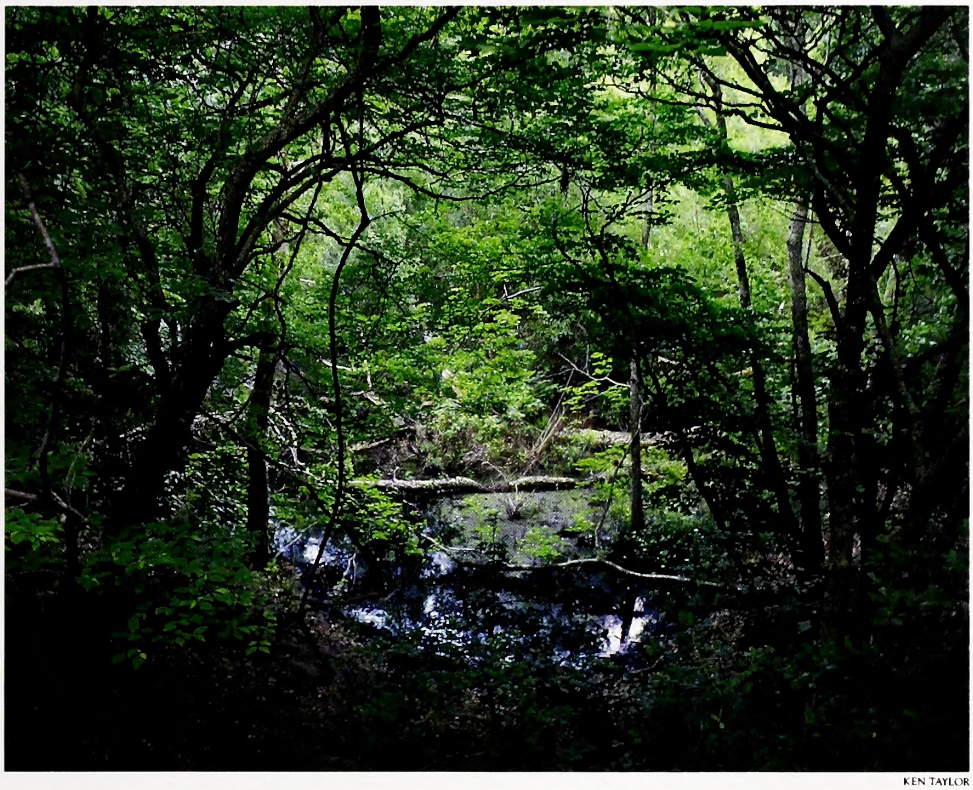
Maritime Forests

The fight to save the maritime forests of coastal North Carolina offers a textbook example of how difficult habitat protection can be. Found on stabilized dune systems on the sound side of many barrier islands, maritime forests are stunted and sculpted by salt spray and wind shear, thriving on sandy soils and low water availability. Formed of dense tangles of live oak, loblolly pine, ironwood, yaupon and American holly, these forest systems survive under — and perhaps because of — the harsh coastal environment. They are home to rare plants such as cabbage palmetto (*Sabal palmetto*), southern twayblade (*Listera australis*), and a subspecies of the Virginia red cedar (*Juniperus virginiana*) known as the coastal red cedar (*Juniperus virginiana* var. *silicicola*).

The forests are also struggling to survive under the harsh conditions brought about by the bulldozer and backhoe. What makes maritime forests so difficult to preserve is that the plant communities are extremely susceptible to even the smallest forest clearings. Storm-borne salt spray may kill portions of the thick canopy, but the forest will hold its own against most natural aggression. Cutting a hole for a house in the streamlined canopy, however, allows salt deposition on exposed trees, which may kill them, exposing more trees to a similar fate. Islands of openings only create larger islands of dead forest, in which dense thickets of secondary growth develop, choking off reproduction by the original species.

The largest remaining tracts of maritime forest include Buxton Woods on Hatteras Island, Nags Head Woods and Kitty Hawk Woods. A 1988 inventory of maritime forests by the Division of Coastal Management surveyed 24 forest areas comprising 12,000 acres. Of those forest sites, 18 (9,500 acres) were partially or entirely in private ownership. According to the survey researchers, given the current rate of development, most of those sites would be destroyed or significantly altered within the next 10 years. The remaining acreage is owned by the government or by private conservation groups and maintained as natural areas.

While there are two distinct types of maritime forests — maritime evergreen forest and maritime deciduous forest — both face the same threats, the same unwritten fate. It's simple. The forest grows on the stable, well-drained, protected portions of our most popular beach areas, ground on which coastal developers would like to plant shopping centers and housing developments. Saving the remaining maritime forests means severely curbing current destruction. For years environmentalists have called for more stringent limitations on development in the dwindling maritime forests. As the minute hand sweeps ever toward midnight, only time will tell if those cries to save this habitat type found listening ears.



KEN TAYLOR

***Adapted to the punishing** climate of barrier islands, maritime forests are no match for the pressures of coastal development. Only about 12,000 acres remain with about 9,500 acres in private ownership. If the current development rate continues, most of the forest sites owned privately will be destroyed or significantly altered within 10 years.*

Freshwater Streams of the Piedmont

"You are looking at the most endangered ecosystem on the face of the earth," says John Alderman. The Piedmont project leader for the state's Nongame and Endangered Wildlife Program is pointing to the waters of the Rocky River, just a few feet from the Highway 15-501 bridge in Chatham County. He's talking about freshwater rivers and streams. There are more animal species in the 2 percent of the earth's surface covered by fresh water than in the 70 percent covered by oceans, Alderman says, and most of that 2 percent is under siege.

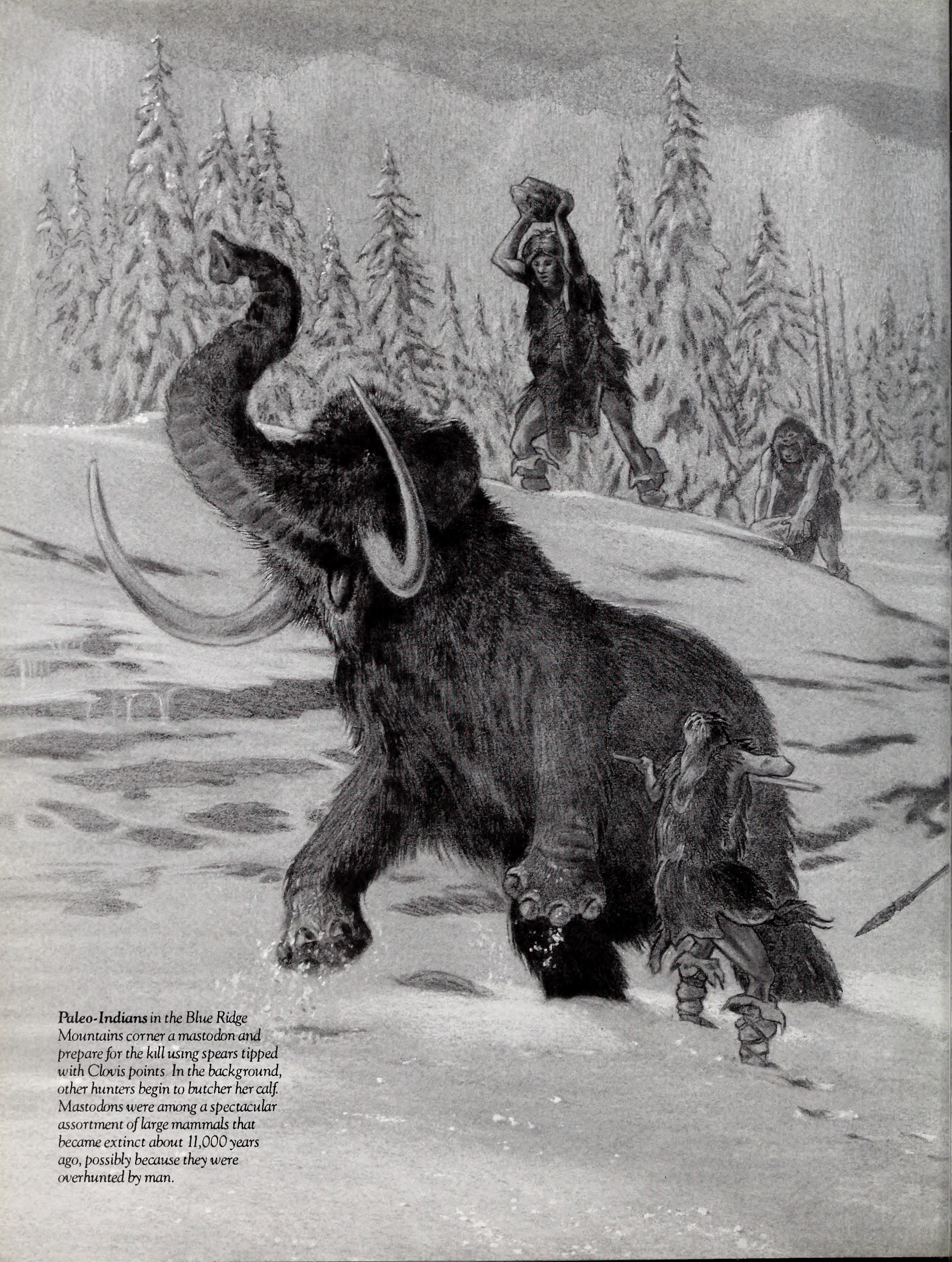
The Rocky River and similar freshwater streams of the Piedmont certainly are. Fouled by industry and out-of-compliance municipal waste-treatment facilities, and bled of water flow by the construction of reservoirs in their critical headwater watersheds, the rivers Tar, Neuse, Cape Fear and Yadkin are facing ecological collapse. A hundred years ago freshwater mussels lined some streambanks shoulder to shoulder. As few as 15 years ago 12 species of mussel could be found in the Rocky River alone. Today, Alderman says, only two mussel species occur there.

Several freshwater mussel species are already on or are headed for state and federal endangered, threatened and special concern lists. Endangered species include the Tar River spiny mussel and the dwarf wedge mussel. Other mussel species have been proposed for the threatened and special concern lists.

Mollusks aren't the only animals awash in Piedmont pollution. The Cape Fear shiner is on the state and federal endangered species lists; the Neuse River waterdog is state-listed as a species of special concern, while the Carolina madtom is proposed for similar listing.

Hope for the Piedmont's freshwater streams comes in the form of aquatic refuges situated in relatively undisturbed headwaters of tributaries. There, besieged species can reproduce, maintaining populations that could recolonize larger streams if ever they are cleaned up. Still, Alderman admits, that is tantamount to playing a shell game with our endangered freshwater streams, putting our few remaining eggs in smaller and smaller baskets.

"If an animal can't live in the water, how can we expect to drink it?" Alderman asks. These mussels and the freshwater streams in which they live are nature's early warning system. He casts a glance towards the waters of the Rocky and adds, "The red light is on." ☒



Paleo-Indians *in the Blue Ridge Mountains corner a mastodon and prepare for the kill using spears tipped with Clovis points. In the background, other hunters begin to butcher her calf. Mastodons were among a spectacular assortment of large mammals that became extinct about 11,000 years ago, possibly because they were overhunted by man.*

What the Bones Tell

Fifty-foot crocodiles, giant mastodons and flesh-eating dinosaurs—some of the most spectacular beasts of all time once lived here before they became extinct. What's the lesson?

written by Lawrence S. Earley
photographed by Melissa McGaw
illustrated by David Williams

In the very long ago, dinosaurs lived and died in North Carolina! Most were several times larger than even the largest black bear hiding out in a mountain cove today. But dinosaurs weren't the only living things with a case of gigantism. In the late Cretaceous Period, about 100 million years ago, 50-foot-long crocodiles stalked dinosaurs in the coastal swamps of the Carolinas. About 4 million years ago, *Carcharodon megalodon*, the ancestor to the great white shark, swam offshore with a body 40 feet long and massive jaws studded with 5-inch teeth. There were scallops the size of saucers. And, more recently, 3-ton sloths mingled with elephant-sized mammoths and mastodons.

They're all gone now, extinct long ago along with 99 percent of everything that has ever lived. Extinction seems to be the natural fate of all species. Many become extinct no doubt because they reach an evolutionary dead end. Others lose out to competitors because they can't adapt fast enough to climatic or environmental changes. More controversial have been reports that periodic collisions between the Earth and asteroids have caused vast numbers of extinctions in an incredibly short time. Theories of extinction abound, making it one of the most controversial topics in the world.

But today scientists are studying extinction with a new sense of urgency. Plants and animals are disappearing from Earth at an astronomical rate, and worries mount over global warming's effects on biodiversity. Says paleontologist Joe Carter of the University of North Carolina at Chapel Hill, "We need to know whether global warming is going to cause mass extinction, or moderate extinction, or just shift faunal provinces."

Fossils are the keys to understanding what animals lived here and why they disappeared. Fossils are the remains or impressions of plants and animals that have been buried in slowly accumulating layers of sediment. The Coastal Plain is rich in fossils, particularly those of the most recent periods, but North Carolina, like many eastern states, yields its older secrets reluctantly. In some periods, there was so much erosion going on that sediment layers were never deposited and thus are wholly missing, according to Vince Schneider, curator of paleontology (the study of ancient life) at the Museum of Natural Sciences in Raleigh. "For example, there's no Jurassic material at all in North Carolina," he says, referring to the period from 208 million years b.p. (before present) to 145 million years b.p.

Yet, though the fossil evidence recovered in North Carolina is skimpier than that drawn from the arid plains of the western United States, these fragments tell a surprising tale. "The evidence suggests that whatever was in the western states was also present in the eastern states," says Clayton Ray, a curator at the National Museum of Natural History in Washington, D.C. "We just don't have as good a record of it." Here, then, is what we know about some of the animals that disappeared from North Carolina during periods when, for different reasons, major extinctions occurred.

Peccary (*Platygonus compressus*)
This fossilized skeleton of an extinct peccary was part of a group of five that expired in a sand storm in Kentucky about 34,000 years ago.

FOSSILS COURTESY OF THE N.C. NATURAL SCIENCES MUSEUM, RALEIGH.

Extinction Through the Ages

The fossil record reveals that mass extinctions of animals have occurred frequently throughout the millions of years of life on earth. Some of these extinctions have been devastating events, like the one at the end of the Permian Period (245 million years ago) when up to 90 percent of marine species vanished along with untold numbers of land species. Other extinctions have been less catastrophic. The time line on these pages depicts life history as it is commonly divided into geological eras and periods. The graphic icons depict life-forms common during a given period. The wide breaks in the line indicate major extinctions; the narrow breaks show minor extinctions. The victims of the major extinctions are also listed.

Sources: Joe Carter, Dept. of Geology, UNC-Chapel Hill; Steven M. Stanley, Extinction (Scientific American, 1987).

Graphics: Nancy Miller.

Cretaceous Period
(145 million b.p. to 65 million b.p.)

Just south of Elizabethtown, in Bladen County, along the Cape Fear River, researchers found one of the richest troves of Cretaceous dinosaur fragments on the East Coast. As the Cape Fear River flows powerfully to the Atlantic, it cuts down through the Cretaceous deposits and exposes fossil fragments of animals that became extinct, possibly in a geological instant, 65 million years ago. Evidence shows that the Cretaceous Period was a time of mostly tropical and subtropical temperatures. The sea came farther inland at the time; scientists are finding evidence of a great shifting delta as far west as Fayetteville, Goldsboro and Greenville created by a river perhaps as mighty as the Mississippi. Great swamps would have been common, with trees not unlike the bald-cypress of today, and roaming these swamps would have been some of the largest and most fearsome creatures of all time.

Albertosaurus. About 29 feet long, this bipedal (two-legged) carnivore was one of a number of tyrannosaurid dinosaurs, related to the gigantic *Tyrannosaurus rex* (about 46 feet long and 19 feet high). The tyrannosaurids were fearsome predators and might have been able to run as fast as racehorses. Though its forelimbs were very small, like those of all tyrannosaurids, *Albertosaurus* used long teeth in a large head to make deep wounds that immobilized its prey, probably the duck-billed hadrosaurs.

Hypsibema. A 4-footed, duck-billed, plant-eating hadrosaur that may have been over 30 feet long. The hadrosaur was a herd animal that traveled in social groups. It could muster little if any defense against speedy predators like the *Albertosaurus*, which no doubt picked off the weak ones in the manner of carnivores today. *Hypsibema* probably fed in upland areas and fled into swamps to escape predators.

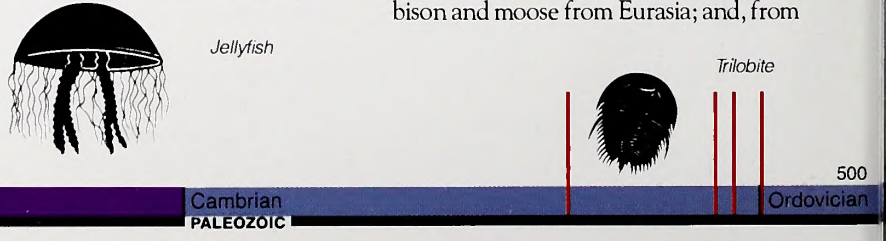
Orthomimimus (ostrich mimic). A toothless, small-headed dinosaur, about 10-13 feet tall, resembling a modern-day ostrich. It was a running creature (perhaps as fast as an ostrich — about 30 mph) whose long tail provided a counterbalance to the front part of its body. It browsed on tree branches, pulling them down with claws adapted for grasping, but it was an omnivore.

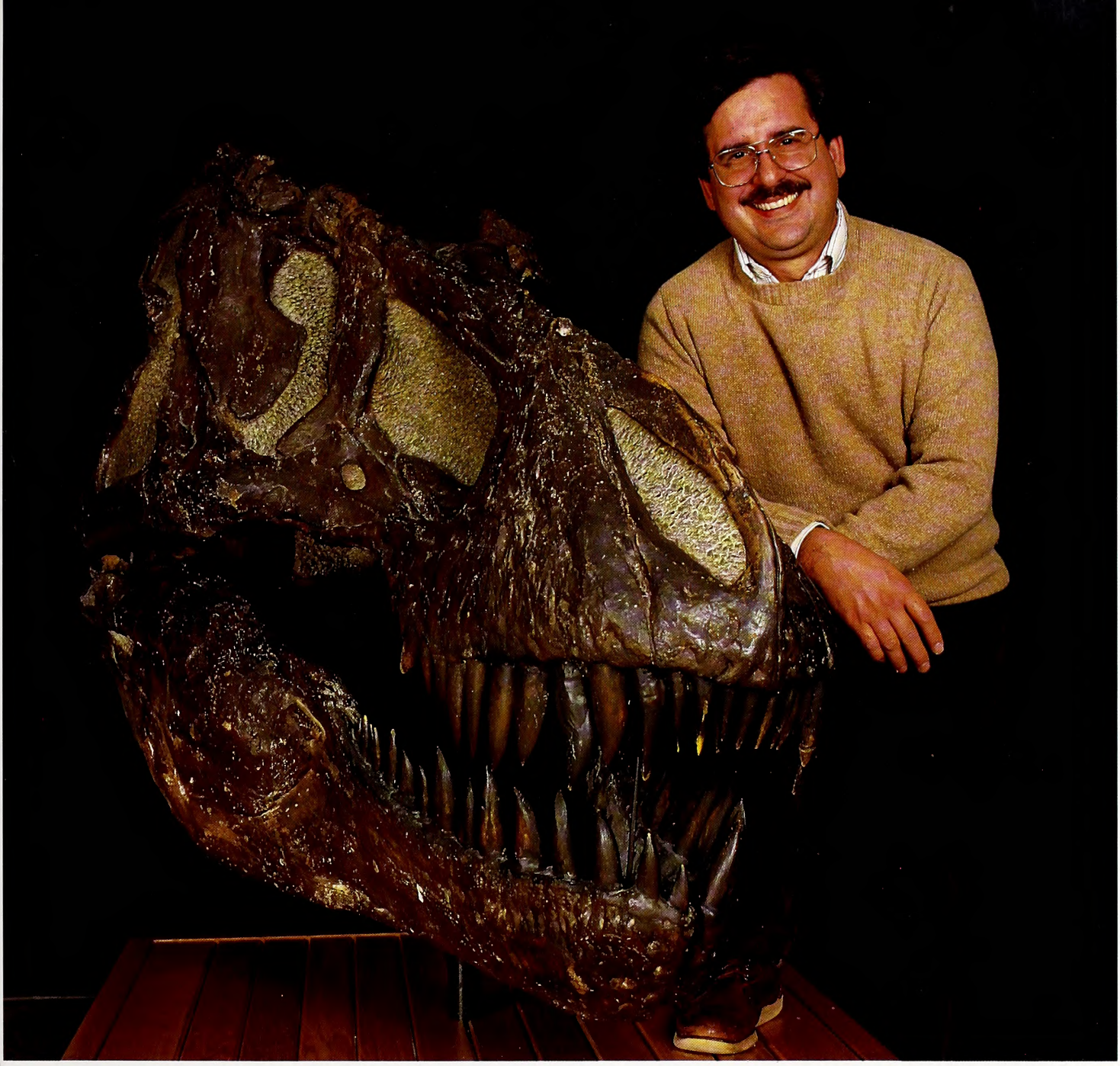
Deinosuchus. Possibly one of the most fearsome non-dinosaur carnivores that ever lived, the *Deinosuchus* was a giant crocodile the remains of which are poorly documented here. One recovered in Texas was more than 50 feet long with a skull 6 feet long, the largest crocodile ever known. Scientists believe that these crocodiles may have been the chief predator on the hadrosaurs.

Pleistocene Period
(1.64 million b.p. to 10,000 b.p.)

The Pleistocene is also known as the Ice Age, a period when mile-thick glaciers advanced and retreated over much of the earth. Though the glaciers did not come as far south as North Carolina, the arctic or boreal climate did cause massive geographic shifts in plants and wildlife. Many species more commonly found in the North survived by migrating south just ahead of the advancing ice sheet. For thousands of years, the Southeast was covered with jack pine and spruce forests more common in the North today, and a timberline appeared in the southern Appalachians.

In North America, it was a time of an extraordinary assemblage of large mammals, many of them coming from all over the earth. Noted Pleistocene scholar Bjorn Kurten observes that, along with such North American natives as horses and camels (both of which migrated into Europe, Asia and Africa; the horse was reintroduced by the Spanish conquistadors) were ground sloths and armadillos from South America; musk-ox, bison and moose from Eurasia; and, from





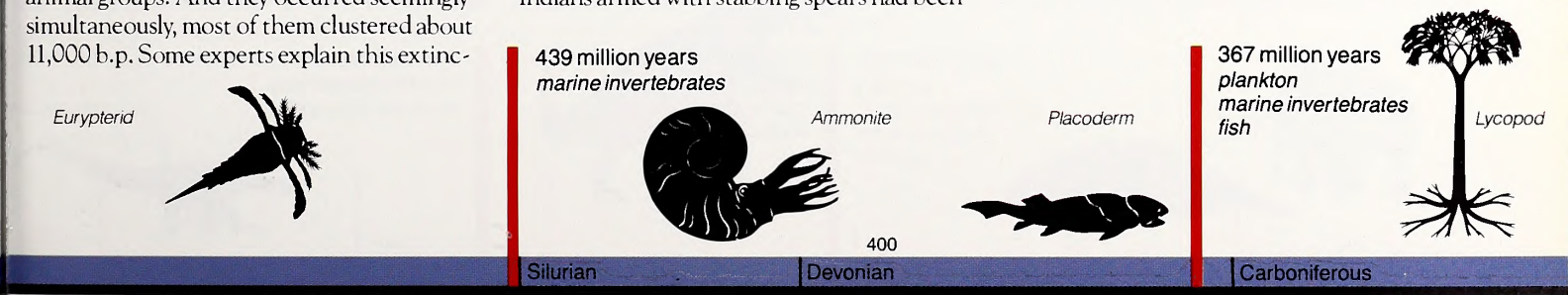
Africa, lions and elephant-like mammoths, perhaps even man.

But as the ice began to retreat, many of these mammals disappeared, some say in a geological eyeblink. By 11,000 b.p., 39 genera of mammals had become extinct.

Strangely, these extinctions mostly affected large mammals, not small ones and few other animal groups. And they occurred seemingly simultaneously, most of them clustered about 11,000 b.p. Some experts explain this extinction as the culmination of the effects of changing climate as the glaciers began to retreat and the weather warmed. Another theory suggests that these animals reached an evolutionary dead end at the same time.

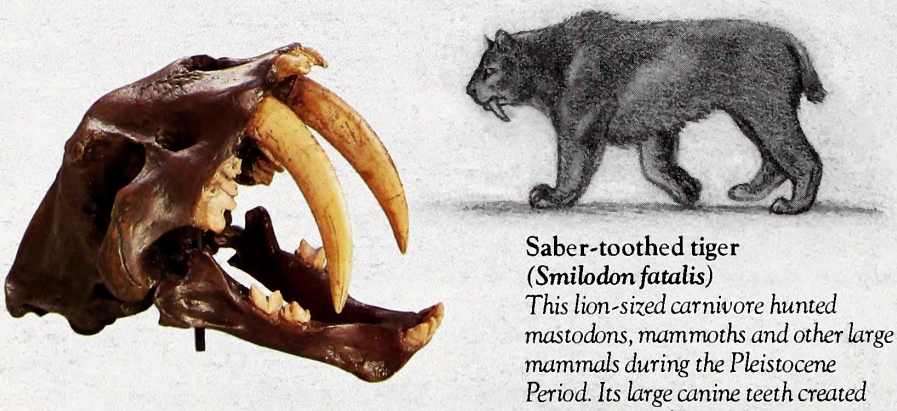
Still other scholars attribute it to the actions of a new predator on the North American scene — man. Hunting bands of paleo-Indians armed with stabbing spears had been

Vince Schneider, *curator of paleontology at the Natural Sciences Museum in Raleigh, stands by a plaster cast of a* Tyrannosaurus rex *skull. Though fossils of this immense carnivore have not been recovered in North Carolina, smaller* Tyrannosaurus *types became extinct here about 65 million years ago.*



Woodland muskox
(Symbos cavifrons)
This skull portion is from an extinct muskox species that wandered the state thousands of years ago during the Ice Age. Muskoxen are today confined to the far north.

Horned camel
(Kyptoceras amatorum)
This skull fragment is from a newly discovered camel that roamed the Southeast about 5 million years ago. Fossil remains related to this camel have been discovered in Beaufort County.



Saber-toothed tiger
(Smilodon fatalis)
This lion-sized carnivore hunted mastodons, mammoths and other large mammals during the Pleistocene Period. Its large canine teeth created massive wounds in its prey.

crossing into North America from Eurasia as early as 13,000 years ago, and by 11,000 b.p., according to this view, these hunting bands were flourishing everywhere on the continent. Rapidly they exterminated the large, almost tame herbivores such as the mammoths and mastodons, dooming the saber-toothed tigers and other carnivores that depended on them for prey.

Of course, many species made it through the Pleistocene extinction, including some animals that are quite familiar to us: the white-tailed deer, opossum, masked shrew, least shrew, eastern mole, long-tailed weasel, spotted skunk, striped skunk, bobcat and beaver. But many of the larger animals are extinct, including most of the larger herbivorous grazing creatures and the predators that preyed upon them. Here are some of the large mammals that roamed throughout North Carolina during the Pleistocene.

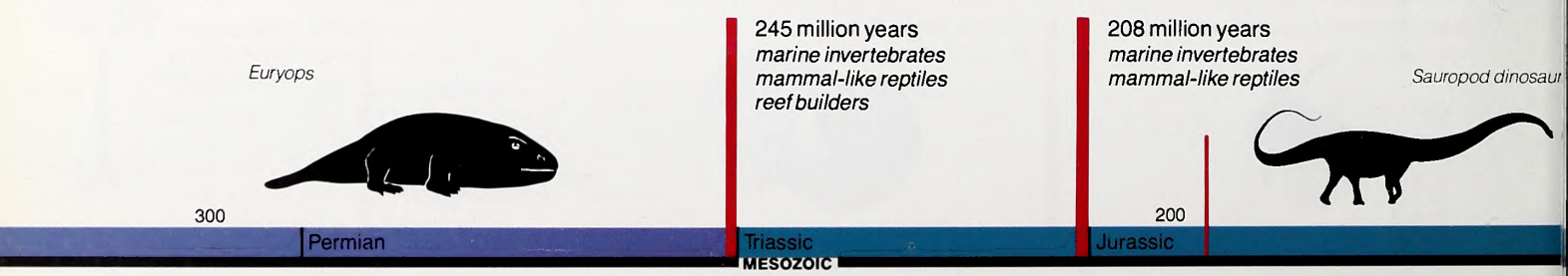
Peccary (*Platygonus compressus*). Extinct somewhat earlier than 11,000 b.p. A pig-like mammal, with straight tusks rather than the curved tusks of pigs. Comparable in size to a modern-day wild hog. It was an extremely fast runner, adapted to the hard ground of the open plains.

Horse (*Equus complicatus*). A common horse in the East, about the size of a modern horse.

Mastodon (*Mammut americanum*). Extinct about 11,000 b.p. According to Clayton Ray, the mastodon flourished everywhere, "from Alaska to Mexico, from the Atlantic to the Pacific, from Florida to Maine, in the mountains as well as in the swamps." It was more of a forest animal and browsed rather than grazed like the mammoth. It had shorter legs than mammoths.

Wooly mammoth (*Mammuthus jeffersonii*). Extinct about 11,000 b.p. A member of the elephant family, the mammoth's tusks were long and curved, and they crossed in front of the head. "I'm sure a mammoth's breath smelled like peanuts," jokes Ray about the similarity between mammoths and modern-day elephants. The 12-foot-tall wooly mammoth had a head that was domed and a sloping back. It favored open prairies.

Woodland musk-ox (*Symbos cavifrons*). Extinct about 11,000 years ago. Adapted to woodlands and plains and somewhat taller and more slender than the musk-ox of today.



Giant beaver (*Castoroides ohioensis*). The largest rodent in North America in the Pleistocene, it was about the size of a black bear. It was probably not a dam-builder like today's beavers.

Simpson's glyptodont (*Glyptotherium floridanum*). A distant relative of the armadillo, this strange creature was a mammalian tortoise, not a reptile. Adults could weigh up to a ton and were about 10 feet long. Their bodies were covered with an inflexible armor consisting of nearly 2,000 body plates. They favored coastal riverine habitats. They migrated into North America from South America and survived until the end of the Pleistocene.

Harlan's ground sloth (*Glossotherium harlani*). A fairly common species, this massively built sloth was covered in shaggy hair and had powerful clawed feet and armored skin to defend itself against carnivores such as saber-toothed tigers and dire wolves.

Hermit ground sloth (*Eremotherium rusconii*). The biggest of all the sloths, this creature weighed up to 3 tons and grew to a length of 20 feet. It pulled down tree branches and browsed the leaves. It probably migrated to North America from South America.

Saber-toothed tiger (*Smilodon fatalis*). A widespread carnivore during the Pleistocene that grew to the size of a modern-day African lion. It stabbed and ripped its prey with 5-inch, curved canine teeth that caused massive bleeding and death. There were several species of saber-toothed cats in North America.

Dire wolf (*Canis dirus*). Another carnivore that was about the size of a large gray wolf, the dire wolf had extremely powerful teeth and jaws, suggesting that it chewed bones somewhat like a hyena. Its large brain suggests it hunted in packs. It might have originated in South America.

Recent history (1492 A.D. to today)

Some scientists think that the Pleistocene mammalian extinctions of 11,000 b.p. are only a portion of a larger extinction "event" that began 20,000 years ago and, indeed, is still going on today. Yet, while there may be great disagreement over what or who killed off the great mammals of the late Pleistocene, there is no denying that humans have caused the pace of extinction to pick up rapidly, especially since the discovery of the New World. For example, in just over 100 years, from 1850 to 1973, 28 birds, 16 mammals and 12 fishes became extinct in the United States. Some of them are profiled below.

Passenger pigeon (*Ectopistes migratorious*). Once the most abundant bird in the world, the last passenger pigeon died in a zoo in Cincinnati. It wintered in North Carolina, migrating by the millions and roosting in large flocks. Market hunting contributed to its demise, as did the felling of oak forests in the Midwest.

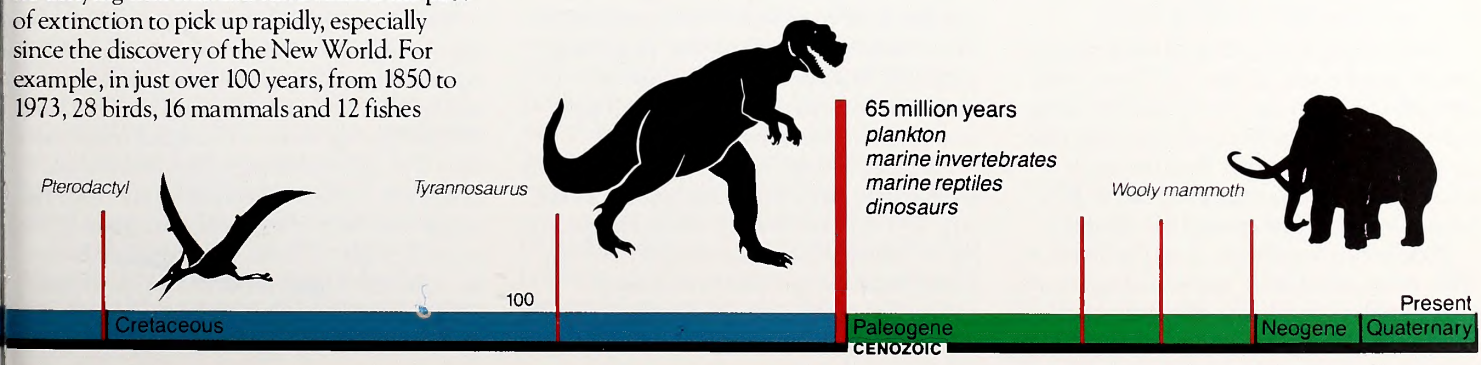
Carolina parakeet (*Conuropsis carolinensis*). These brightly colored parrots — the only parrot species in the United States — were once common birds in North Carolina swamps. Orchard owners shot depredating parakeets, and their orange and green feathers were sought by milliners for ladies hats. Also, the birds returned to the sound of a wounded parakeet, a behavioral trait that sealed their doom.

Ivory-billed woodpecker (*Campephilus principalis*). About the size of a pileated woodpecker, the ivorybill is believed to be extinct, although some ivorybills were glimpsed in Cuba recently. These birds fed on insects beneath the bark of dead trees chiefly in bottomland swamps. Overhunting and habitat destruction are responsible for their demise.

In response to the mounting interest in ancient life, the Museum of Natural Sciences has recently opened a fossil lab, where visitors can watch workers removing dinosaur bones from rock in which they are embedded. During the next four years, curator Vince Schneider and other museum volunteers will be collecting dinosaur fossils in Wyoming on digs assisted by dinosaur expert Robert Bakker. "We're doing it for two reasons," Schneider says. "One is because we'd like to exhibit a dinosaur in Raleigh. We're also building up expertise in excavations so we can use these skills on digs in North Carolina."

Schneider is excited about the future because his interest in the past is bearing fruit. "It hits me when I go to the beach," he says, "and I consider that there were really big seal populations off the North Carolina coast at one time, and walruses like they've got in Washington State. That's still amazing to me."

***School children at the** Natural Sciences Museum gaze at a mounted Carolina parakeet, one of several bird species that have become extinct within the past 100 years. The bird is among the heavy toll of wildlife that man has taken since his appearance on the North American continent.*



Un-Endangered WILDLIFE

Despite the crisis facing many wildlife species, others are enjoying prosperity and abundance. In many cases, it's no accident.

written by Jim Dean
photographed by Ken Taylor

It's a tough world out there, and the future doesn't look very bright for many species of animals. For some, the crisis looms in the distant future. For others, survival is already a day-to-day gamble, and the struggle isn't taking place only in some distant jungle, but also right here in North Carolina.

With the list of threatened and endangered animals growing steadily, it's easy to understand why there's a widespread belief that almost all wildlife is in trouble. Consider, for example, the following list of species native to North Carolina — the bluebird, wild turkey, bald eagle, white-tailed deer, alligator, wood duck, beaver, brown pelican and osprey. If you asked a class of kids, people on the street or even some highly educated groups to identify any that are threatened or endangered, you'd surely be told that some of these — perhaps all — are in trouble.

And yet, the truth is that all these species are doing quite well. In fact, the white-tailed deer population in the North Carolina alone is estimated at 700,000, an all-time high that some believe to be greater than the entire continental population of whitetails in 1492 when Columbus first crossed the Atlantic.

Populations of such species as the bluebird, wild turkey, wood duck, beaver and osprey are either stable or increasing. Bluebirds have rebounded sharply from their earlier low levels, and the same is true of southern wood ducks. The wild turkey population in the state now stands at an estimated 25,000, up from levels that may have fallen as low as 2,000 birds midway through the century. The beaver, which was nearly extirpated from the state, has made such a strong comeback that it is now considered a pest in some areas. Though once a rare sight over North Carolina's waters, ospreys are again common. You can add foxes, raccoons, groundhogs, opossums, gray squirrels, swans, snow geese and mourning doves to the species that are abundant and generally prospering.

Even federally endangered species like the bald eagle, brown pelican and alligator seem to have turned the corner. Eagles and brown pelicans — along with the osprey — have responded dramatically to the ban on DDT and other efforts to restore their populations. After the alligator was provided protection under the Endangered Species Act, its numbers rebounded so sharply that it is no longer rated as endangered.

Among the larger species that are currently receiving special attention are the black bear, otter and red wolf. Though still threatened by loss of habitat, black bears in eastern North Carolina have responded to increased protection, and their short-term outlook, at least, is improved. Otters are now being reintroduced into the western part of the state, where they were virtually extirpated earlier in the century. The red wolf is a special case because this native species has been staring extinction squarely in the eye for many years and owes its existence to captive breeding. As such, it is the first species to be reintroduced from a totally captive population, and North Carolina's Alligator River National Wildlife Refuge is one of the major restoration sites. Though it's still too early to predict success, some of the released wolves are breeding in the wild. With the possible exception of the red wolf, none of the species mentioned so far is considered a likely candidate for extinction.

Surprised? You shouldn't be. Such success stories are actually not all that uncommon,

The white-tailed deer *was relatively uncommon in most of the state until fairly recently. Through conservation efforts led by sportsmen, however, the whitetail is today the most popular game species in the state.*

and that's true not only in North Carolina but elsewhere around the nation. Even in some nations — particularly in Africa and South America — that are experiencing drastic losses of wildlife, not all the news is bad.

Though it may not be obvious at a glance, many of the species that are prospering or rebounding from previous low populations have something in common. While they may originally have been threatened by mankind's activities, they have since benefitted from our recognition of their plight and from subsequent research, management and restoration.

The oldest and still the best-organized effort to provide ongoing stewardship for certain wildlife species can be traced to those who hunt for sport. Through state and federal research, management and game law enforcement programs that began, for the most part, in the 1930s and '40s, sport hunters brought an end to market hunting and imposed regulations and programs to protect the species they pursued. That is the main reason populations of wild turkey, white-tailed deer, wood ducks and many other game species are prospering. And although populations of some waterfowl species are down, organized and well-funded habitat restoration programs are under way. If they don't prove successful, surely even greater efforts will be proposed and funded. Populations of small-game species like bobwhite quail and rabbits have also generally declined in recent decades, but hunters have an admittedly vested interest in their welfare

Once an endangered species, *the brown pelican has made a remarkable recovery in the past 20 years. Its chief threat was residues of the pesticide DDT in its prey which caused egg-shell thinning when eaten. Banning of DDT has removed this threat. Today the pelican is listed as a species of special concern.*

and aren't likely to let bobwhite and rabbit populations reach the true danger point.

That is not to say that there is no reason to be concerned about game species, since dwindling habitat, pesticides, pollution and other threats will prove very tough to overcome. Yet, it is worth noting that, of all the wildlife species currently in serious trouble, no game species hunted for sport is on the endangered list. Indeed, game species — even those few that are currently experiencing problems — have a better chance at present of being restored than the countless others with no constituency.

The good news is that game species no longer stand alone in this regard. Over the past decade or so, nongame species have also generated concerned constituencies. Federal and state wildlife agencies — including the N.C. Wildlife Resources Commission — have expanded their research, management and protection to include nongame, threatened and endangered species. Restoration of the brown pelican, peregrine falcon, bald eagle and other endangered or threatened species marks the success of these cooperative government-sponsored efforts. In North Carolina, the Nongame and Endangered Wildlife Section, funded largely by a voluntary income tax checkoff, is beginning to make significant headway surveying, studying and protecting many species that have previously received no attention.

"It's true that most of the wildlife success stories have been with game species, especially big game, but historically, that's where the interest and funding has been," said Randall Wilson, head of the Wildlife Commission's Nongame and Endangered Wildlife Section. "If similar funding had been available for nongame species when this agency was organized in 1947, I feel we would have even more success stories.

"Since our nongame program has been in effect only a few years and has been funded by the tax checkoff only since 1984, this means we're playing catch-up," said Wilson. "Even so, we're making progress, and we can see increases in populations for those species we've worked with. The thing to remember is that we're dealing with a total of about 900 vertebrates (of which only about 200 are game animals or game fish). We've also got some 30,000 invertebrate species like mollusks and crustaceans. We can continue to make progress with our present annual budget of $450,000 (largely contributed), but to make a real dent, nongame programs are going to need much greater funding. We need to find a way to involve that vast majority of folks who pay little or nothing to help wildlife, especially nongame wildlife."

In recent years, a few of the wildlife success stories have been the results of the efforts of private groups and individuals. The bluebird is a good example of what private volunteers can do to restore a species. The construction and erection of bluebird boxes to replace lost nesting habitat has helped this songbird rebound from its former low numbers. But such widespread, basically unorganized efforts are the exception and seem effective only with well-loved and popular species.

Not all the wildlife species thriving today owe their prosperity to stewardship by man. Many are simply more adaptable to rapidly changing habitats and conditions. The house sparrow, for example, can nest even in a shopping center sign, but a bluebird demands a very specific type of nest site.

Nor is the ability to adapt the only reason some species are increasing their numbers. Indeed, the high populations enjoyed by some species are warning signs that habitat is losing its desirable diversity. For example, the conversion of Coastal Plain forests and swampland to cropland and single-species timber plantations has destroyed the habitat for countless native species. Yet, these changes create nearly ideal habitat for a few species. For example, the large eastern croplands are particularly favored by blackbirds, starlings and cowbirds. Thus, in nature's complex arrangement, prosperity for one or two species is not necessarily a good sign.

Finding ways to save threatened and endangered animals will undoubtedly be an ongoing problem as long as any of us are alive. Still, it's important to remember that many species of animals are not threatened or endangered. That means the situation may not be as hopeless as some believe, because the fate of such species as white-tailed deer, bluebirds, bald eagles, wood ducks and wild turkeys shows the way. The knowledge exists. What's needed is commitment and money. ☒

Thank You for Your Support!

NORTH CAROLINA NONGAME & ENDANGERED WILDLIFE FUND

The remarkable recoveries of the white-tailed deer, the wood duck and the brown pelican show what can be done when people care about wildlife. Who cares for wildlife? You do, of course, and your donations to the Nongame and Endangered Species Program mean that many endangered species have a chance for survival. Please keep giving. Make your contribution directly or through the state income tax checkoff to the Nongame & Endangered Wildlife Fund, N.C. Wildlife Resources Commission, 512 N. Salisbury St. Raleigh, N.C. 27604-1188.

Can I Make a Difference?

You bet! Here's how to get started.

by Jane Krupnick

"Never doubt that a small group of thoughtful, committed citizens can change the world. Indeed, its the only thing that ever has."
— Margaret Mead

Protecting species may seem like a tall order, given some of the problems discussed in these pages. But don't give up! There are solutions to every problem and you can make a difference. First, you can develop an optimistic and determined attitude. Then you can learn about the world around you and cherish life on earth—plants, animals and humans alike. Lastly, take action. Some of the ideas below may help you change the world.

Inform yourself

Become a responsible steward of the natural world. The first step to responsible stewardship is becoming informed. The more informed you are, the better able you will be to take appropriate action.

- Read articles about the environment in daily newspapers, weekly newsmagazines and monthly magazines like *Wildlife in North Carolina.*
- Read one of the books listed in this article or one you select from the "Ecology" section of a bookstore.
- Watch nature specials on PBS and the Discovery Channel.
- Talk to your grandparents or someone else's. What did they do before disposable diapers, twice-weekly garbage pickup, household chemical cleansers, single-serving packages?

Involve yourself

You *can* work with others to tackle the problems at hand to the best of your ability. Be as active as you can, but don't be discouraged if it doesn't seem like enough. Every bit counts.

- Join the whole family in a conservation organization and attend local meetings or outings.
- Attend public hearings. Any citizen can state his or her opinion. Speak out if you want to be heard.
- Volunteer your time to an organization working on a cause important to you.
- Support conservation legislation. Contact elected representatives through letters, phone calls, telegrams or visits, and let them know where you stand on issues.

Inform others

Exchanging opinions and knowledge with friends and colleagues is one of the best ways to effect change and to clarify your own thoughts and ideas.

- Invite a speaker to your club (any club) to talk about endangered species. Or prepare a talk yourself on a topic of interest, an environmental book you read or a vacation you took to an ecologically sensitive area.
- Write a letter to the editor and tell him or her what you think about endangered species.
- Talk to children and exchange ideas with them on how to tackle environmental problems.

Exercise your consumer power

Where you spend your money can motivate companies to make changes.

- Don't patronize companies with environmentally unsound products and services. Write companies and let them know why you don't buy their products.
- Don't buy products that are made specifically from threatened or endangered species of plants and animals.
- Never buy animals captured from the wild, such as parrots, tropical fish, exotic snakes and lizards. More animals die than reach pet stores in the U.S. because of harsh conditions when capturing and transporting them. Illegal wildlife trade is draining wildlife from many natural habitats.
- Choose domestic woods like oak, pine, birch, maple or cherry instead of tropical woods like mahogany, ebony, rosewood and teak, which are harvested on a nonsustainable basis.

Entertain yourself

There may be a lot to learn, but you can learn and even help save endangered species while you and your family have fun.

- Go to the North Carolina Zoo in Asheboro, the Museum of Natural Sciences in Raleigh, the Western Carolina Nature Center in Asheville or one of the three North Carolina aquariums on the coast.
- Go on a field trip with the North Carolina Nature Conservancy, the North Carolina Museum of Natural Sciences or the Audubon Society.
- Go on an "ecotour." A number of organizations are promoting travel to ecologically sensitive areas of the world to demonstrate that tourism can be more profitable to a country than exploiting wildlife or depleting natural resources. Magazines from the Sierra Club, the National Audubon Society or The Nature Conservancy have information about ecotours. Also contact the World Wildlife Fund and Natural Habitat Wildlife Adventures, Route 171 North, Box 789, McAfee, NJ 07428.
- Volunteer to help scientists on research projects around the world. Two organizations that provide these types of trips are: Earthwatch, 680 Mount Auburn St., Box 403, Watertown, MA 02272, (617) 926-8200, and Foundation for Field Research, P.O. Box 2010, Alpine, CA 92001, (619) 445-9264.

Invest your money environmentally

As in consumer power, investor power is another forceful strategy with which to tackle the world's environmental woes.

- Divert some or all of your tax refund to the Nongame and Endangered Species tax checkoff program of the N.C. Wildlife Resources Commission. This money is used to protect and conduct research on endangered species in North Carolina.
- Invest your money only in companies with sound environmental policies. A number of environmental money market funds already exist.
- Donate money to environmental organizations and causes, even if you can do nothing else. Many nonprofit organizations depend entirely on donations.

Develop an attitude — care about your environment

You may know the facts but be uninspired to act unless you have the right attitude. Cultivate a positive, resolute and concerned attitude in yourself and others. Only then will you be motivated to act.

- Set an example to friends, children and peers. Don't be shy about sharing your accomplishments.
- Take your environmental practices to work. Organize environmental projects with coworkers.
- Report illegal activity such as poaching by calling the Wildlife Commission's hotline number: 1-800-662-7137.
- If you see an endangered animal, observe it quietly from a distance. Don't try to approach it or catch it even if it seems to be abandoned.
- Don't release exotic species (species that are not native to the area). Exotic species often compete with native species and may fare better or spread diseases, driving native species to extinction.

Can I Make a Difference?

Conserve water and energy

Misuse and overuse of water and energy can lead to extinction of plants and animals by polluting and destroying natural habitats.

- Install a water-saving showerhead.
- Use energy-efficient (compact fluorescent) light bulbs, and turn off lights not in use.
- Recycle, reuse and reduce everything you can, especially paper, plastic, glass and aluminum.
- Walk, bicycle or carpool.
- Use biodegradable or recycled products.
- Put a displacement device in your toilet so less water flushes needlessly. A plastic bottle filled with water works better than a brick, pieces of which might break off and damage your plumbing.
- Turn off the water while you brush your teeth, shave or wash dishes.
- Recycle motor oil.
- Heat your house efficiently. Make sure your home is properly insulated.

Create and protect wildlife habitat

One of the biggest threats to wildlife is the destruction of natural wildlife habitat. You can help offset habitat destruction by creating more or helping protect existing habitat.

- Erect a bird- or a bat house. The Wildlife Commission has a publication on birdhouses and feeders.
- Turn your yard into wildlife habitat by planting native shrubs that provide food and shelter for birds, butterflies and other animals. Contact the National Wildlife Federation for information on their Backyard Wildlife Habitat program. The National Audubon Society can also provide information. If you have a woodlot, contact the North Carolina Forestry Stewardship program to develop a good forest management plan: (919) 733-2162.

Be a litter champion

- Never litter. Litter, especially plastic, does untold damage to wildlife. Some animals mistake it for food, eat it and die, while others become entangled or entrapped by litter and die. If you see litter, pick it up.
- Participate in The Big Sweep, a one-day event in September in which thousands of volunteers gather litter and record their "findings" for a national database. Contact UNC Sea Grant at (919) 737-2454 for information.
- Snip plastic six-pack rings before discarding to prevent them from ensnaring wildlife.

ORGANIZATIONS

American Forestry Association
Global Releaf Program
P.O. Box 2000
Washington, DC 20013
(202) 667-3300

Environmental Defense Fund
257 Park Ave. South
New York, NY 10010
(212) 505-2100

Especially for Kids

- Don't release balloons. They eventually come down and are often mistaken for food and eaten by endangered animals such as whales and sea turtles. These animals often starve to death.
- Ask your school cafeteria to buy only dolphin-safe tuna.
- Recycle your old toys by giving them to a worthy cause.
- Encourage your school to recycle.
- Find out which endangered species are found in your area and what programs or projects in your area might damage these species and their habitat. Write a report, make a poster, design a mural or bulletin board, write a poem or a play. Invite parents and other classes to see your creation.
- Write letters to government officials or presidents of companies that exploit wildlife. Let them know what you think.
- If you are in junior high or high school, create an environmental project for the annual school science fair. The Wildlife Commission will give a prize to the best in each of the three regions in the state.
- Read a book on the environment!

A Kid's Guide to How to Save the Planet, by Billy Goodman (Avon Books, 1990).

50 Simple Things Kids Can Do to Save the Earth (The Earth Works Group, 1990).

Going Green: A Kid's Handbook to Saving the Planet, by John Elkington (Tilden Press, 1990).

National Audubon Society
645 Pennsylvania Ave. SE
Washington, DC 20003
(202) 832-3200

National Wildlife Federation
1412 16th St. NW
Washington, DC 20036
(202) 797-6800

Natural Resources Defense Council
1350 New York Ave. NW, Suite 300
Washington, DC 20005
(202) 783-7800

The Nature Conservancy
1815 North Lynn St.
Arlington, VA 22209
(703) 841-5300

Rainforest Alliance
295 Madison Ave., Suite 1804
New York, NY 10017
(212) 599-5060

Save the Manatee Club
500 North Maitland
Maitland, FL 32751
(407) 539-0990

The Sierra Club
730 Polk St.
San Francisco, CA 94109
(415) 776-2211

U.S. Fish and Wildlife Service
18th and C Sts. NW
Washington, DC 20240

The Wilderness Society
1400 I St. NW
Washington, DC 20005
(202) 842-3400

World Resources Institute
1735 New York Ave. NW
Washington, DC 20036

World Wildlife Fund
1255 23rd St. NW
Washington, DC 20037
(202) 293-4800

READING LIST

Biologues (series of fact sheets on endangered species), U.S. Fish and Wildlife Service.

Endangered Animals, part of ZooBook series from Wildlife Education.

The Endangered Species Handbook, Greta Nilsson, Animal Welfare Institute.

Endangered Species: Wild and Rare (part of NatureScope series), National Wildlife Federation.

On the Brink of Extinction: Conserving the Diversity of Life, Edward Wolf (World Watch paper 78, June 1987).

Our Earth, Ourselves — The Action-Oriented Guide to Help You Protect and Preserve Our Environment, Ruth Caplan (Bantam, 1990).

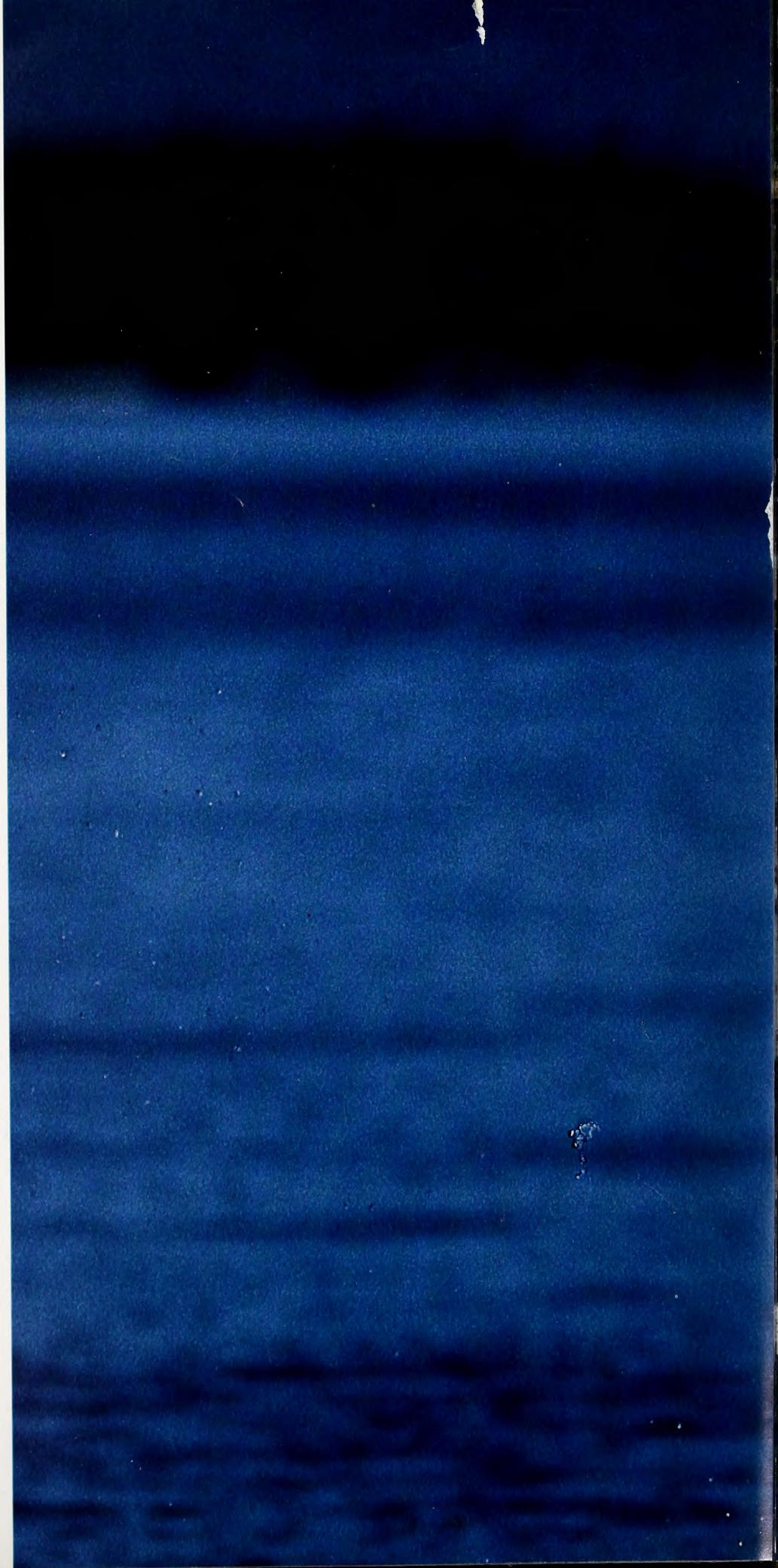
Preserving America's Tropics: What You Can Do, Natural Resources Defense Council, 1990.

Rainforests: Tropical Treasures (NatureScope publication), National Wildlife Federation.

67 Ways to Save the Animals, Anna Sequoia (Har-Row, 1990).

Save Our Planet: 750 Everyday Ways You Can Help Clean Up the Earth, Diane MacEachern (Dell, 1990).

The bog turtle is a threatened species, but you can help save it.
Support the Nongame and Endangered Wildlife Fund by contributing part of your state tax refund. See page 38 for details.



Eagle Still Soars

Above all other wildlife species, the bald eagle symbolizes the nation's fight to save endangered species.

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WILDLIFE IN NORTH CAROLINA

APRIL 1991 $1.50

The Case of the Blue Biologist

by Jim Dean

Early in the 1970s, one of the N.C. Wildlife Resources Commission's newest employees headed west out of Raleigh with a camera, a notebook and a roadmap. His assignment was to write a feature about fish kills and the growing threat of pollution. To this very wet-behind-the-ears reporter, even the term "fish kill" sounded strange—like a turkey shoot or something you'd attend for entertainment.

But this was no barn dance. There had been a massive die-off of fish in the Yadkin River below a tributary flowing out of Winston-Salem. Something had apparently killed everything in the river for miles downstream. Now, several days later, bloated rafts of dead fish floated in eddies, and the banks were covered with fish splitting open and rotting in the hot May sun.

Commission biologists and enforcement officers had been running up and down the river in boats around the clock gathering the fish. By law, every dead fish had to be collected and identified in order to determine the value of the loss. It was stinking, back-breaking work, and stopping to puke occasionally was not unheard of. It ended only when the fish were collected, had sunk or turned too soupy to scoop up in a net.

ILLUSTRATION BY JACKIE PITTMAN

The reporter arrived and spent a morning taking pictures and interviewing those who were involved while trying to stay upwind as much as possible. At lunchtime, those who had an opportunity usually sought some momentary relief in the shade away from the river and the stench, but the reporter found one biologist still on the muddy shoreline.

Cape Carnes, a district fisheries biologist, was sitting on top of a 10-foot pile of dead fish, eating his lunch — a can of sardines.

"Everything smells like fish and tastes like fish, so I might as well eat fish," he explained, obviously enjoying the interviewer's look of queasy disbelief.

If I had ever believed that state employees were a faceless bunch of humorless, lazy puppets intent on complicating any seemingly simple task, the myth died that day. During the past 20-odd years, there have been plenty of similar stories that reveal the humor — and frequently the dedication — of the people who yield any chance for significant monetary gain in favor of a wildlife career. Such a life has its moments, however, and one of the most memorable involved the phantom bear of N.C. State University.

Perhaps you recall several years ago that there were unsubstantiated reports a black bear had visited the campus in downtown Raleigh, leaving tracks in the mud leading into a large, dark culvert. Whether it was a hoax or a badly confused bear was never determined, but after considerable speculation in the media, the Wildlife Commission was asked to summon its bear biologist from Morganton. It is doubtful that anyone knows more about the Southeast's black bears than John Collins.

Suffice to say, however, expert bear biologists do not resemble expert investment bankers, and the lack of a 3-piece suit isn't the only difference. John, for example, has a somewhat traditional regional accent, and a keen sense of the absurd.

So here we are on the 6 o'clock news with television cameras everywhere and people crowded around the well-lit entrance to the culvert. After an impressive introduction, John is hauled into the spotlight.

"Mr. Collins, were these tracks leading into the culvert made by a bear?" asks the interviewer.

"Wa'el, they shore look lack bar tracks to me," says John sincerely. The interviewer plows on grimly hoping to get a more definitive answer.

"But if this is a bear track, Mr. Collins, how much does it weigh?"

"I don't rightly know, Maam," said John, "I ain't never weighed a bar track."

Then there was another incident involving the aforementioned Mr. Carnes. He was treating a pond with blue dye to shade out weed growth, and it seemed inefficient to dribble it over the side of the boat. Why not, he thought, pre-mix it with, say, six inches of water in the bottom of the small johnboat, get the boat up to speed and open the rear drain plug? The chemical would be sucked out of the drain at a steady rate and further mixed by the prop.

It worked great, and Cape was making good progress until he turned around to admire the spreading color and ran the boat up on the bank. The impact flung him headlong and face down into what proved to be a persistent concoction.

"I can't come to your important staff meeting," he informed the Raleigh office the following day. "I'm blue."

"Listen, Cape, come on anyway," he was told. "Everybody occasionally has an off day when they feel sad, but we've got work to do and we need you."

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WILDLIFE IN NORTH CAROLINA

Wildlife in North Carolina is the official educational publication of the North Carolina Wildlife Resources Commission, and is dedicated to the sound conservation of the State's wildlife and other interrelated natural resources and the environment we share with them.

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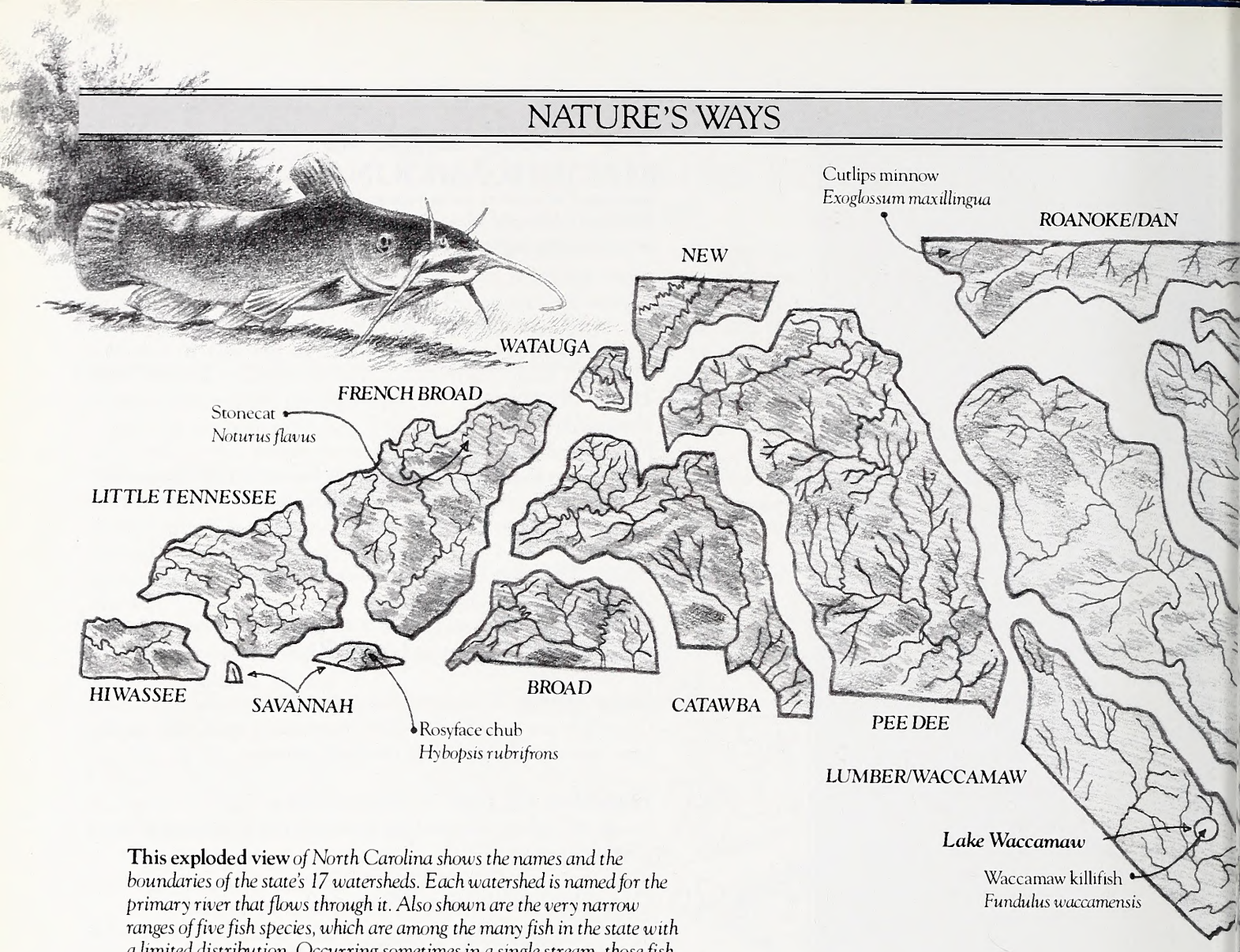


This exploded view *of North Carolina shows the names and the boundaries of the state's 17 watersheds. Each watershed is named for the primary river that flows through it. Also shown are the very narrow ranges of five fish species, which are among the many fish in the state with a limited distribution. Occurring sometimes in a single stream, those fish may be more vulnerable to pollution than fish that range more widely.*

The Puzzle of Range

written by Lawrence S. Earley
illustrated by David Williams

Why are some fish found just about everywhere in North Carolina while other fish are so rare that their entire population is concentrated in a single mile on a single stream?

One of the state's most widespread fish species is the largemouth bass, an avidly pursued game fish that inhabits almost every warm-water river, lake and pond from the mountains to the sea. But few fish match that range, and scores of fish inhabit only a fraction of it. The pinewoods darter, for example, is confined to tributary streams of the Lumber River and the Little Pee Dee River; the spotted darter is presently indigenous to streams of the Little Tennessee River in the mountains (although it was historically found in the French Broad River). And the Cape Fear Shiner occurs nowhere else in the world except in a few streams along the Cape Fear River near the Fall Zone.

Of course the largemouth didn't come by its vast range naturally. Originally, the largemouth bass in North Carolina was native only to mountain rivers draining into Tennessee, and it was only after decades of introductions that it became established throughout the East.

Thus a small range may well represent the norm among fish, although not always. Some fish are limited to a river drainage or two because they are at the edge of their range in North Carolina. This is the case with an astonishing number of fish associated with the French Broad, a river that flows west to the Mississippi River. The river carpsucker is one of these fish, a species found nowhere else in the state, although it's quite common in Tennessee and other states drained by the Mississippi.

North Carolina's Endemic Fish

Approximately 25 fish species have ranges restricted to North Carolina or to drainages shared by neighboring states. Among these are the true endemics, five species confined entirely to North Carolina. Below are the endemic fish and the drainages in which they are found.

Carolina madtom *(Noturus furiosus)*	Neuse
Cape Fear Shiner *(Notropis mekistocholas)*	Cape Fear
Waccamaw darter *(Etheostoma perlongum)*	Lumber/Waccamaw
Waccamaw killifish *(Fundulus waccamensis)*	Lumber/Waccamaw
Waccamaw silverside *(Menidia extensa)*	Lake Waccamaw

And a limited range may obscure a population that's healthy and expanding. A good case in point is the red shiner, which is widespread outside the state in streams of the Mississippi drainage but in North Carolina only occurs in the Yadkin River drainage. If you looked only at its range you might consider it one of the rarest fish in the state. However, it's a species only recently introduced and its range is expanding so rapidly that it may threaten some of our native fish species.

Other fish have limited ranges because they are "endemics," or species confined to a particular locality by geographic barriers or other factors. North Carolina has fish endemic to localities totally within its borders, and other fish are endemic to small areas shared by South Carolina and Virginia.

Endemics result from several natural processes. Some fish require such precise environmental conditions that they can only exist in one or two spots. Apparently this is the situation with the Carolina pygmy sunfish, a Coastal Plain fish restricted to streams and canals associated with the Waccamaw River. Biologists suspect that the fish is more tolerant of the very acidic waters of these streams than its competitors.

Other endemics may have only recently evolved and consequently their range is expanding slowly. Biologists don't know of any endemic fish in North Carolina that fall into this category. Indeed, most endemics result from the opposite process — once widespread they are now hanging on in isolated pockets of remaining habitat. One of these relict species is the stonecat, a catfish common in other states and historically more common in North Carolina but today confined to a single mile of the Cane River. Habitat alterations either by climate change or pollution are often responsible for relict populations.

All freshwater fish and mollusk species are vulnerable to siltation, pollution and other degradation of aquatic habitat, but species with limited ranges are in an even more precarious situation. A single pollution event may threaten an entire population. That's one reason why 21 percent of the freshwater fishes in North Carolina are proposed for protection.

HEAVY NYMPHING

What the dry fly purist is to a Rembrandt, the nymph fisherman is to an air-brushed Elvis on black velvet. Join a dedicated deep-water dredger in a cantankerous look at this crazed craft.

written by Vic Venters
illustrated by Robin Ade
photographed by Steven A. Wilson

As a boy, I learned to fly fish from a man who plied warm waters for bream and bass with an old Shakespeare glass rod and three-for-a-quarter popping bugs. He used a cheap level fly line — not the best for flinging big corky poppers — but the grace of his casts whistled a tune that the fish seemed to like. My grandfather never saw much need for a fly reel either, and I still remember how the line used to lie in green curls at the bottom of his little black johnboat. It never seemed to tangle, or so my memory serves.

That's probably why I've so little patience with dry-fly snobbery. You still see this sort of upper-crusty bunk popping up in the opinion columns of fly-fishing mags, often foisted by bitter old-timers resentful of the intrusion of newcomers flocking to "their" sport or those in possession of too much newly minted money. A quick turn of the page from me, and no apologies either.

Nothing wrong with the dry fly, mind you, and floating size-20 sulphur duns toward a pod of sipping rainbows admittedly has its charms. But I much prefer nymphing using lots of weight — enough to sink a tugboat or at least a size 6 golden stonefly. I like to fish nymphs tickling the bottom, on a short straight line in fast water down eye to eye with all those old wily browns tired of looking at a parade of Royal Wulffs floating by.

The experts call this outrigging or short-lining. I call it "heavy nymphing." (I dunno, maybe it's the music I listen to.) This technique basically boils down to chucking a lead-weighted nymph a short distance upstream or up and across and dead-drifting it back through deep runs, plunge pools and fast pocket-water on a short line, following the end of the fly line or strike indicator with the rod tip. The fly tumbling drag-free along the bottom appears to be a helpless nymph that's been knocked off its perch and probably looks to the trout like a Sweet 16 donut looks to me on a camping trip. If your indicator or line hesitates, you strike, and hopefully you've latched onto that proverbial German submarine.

Since your nymph is weighted and there's plenty of lead split shot on your leader, the whole affair generally casts like a tow cable, and the additional use of plastic or foam strike indicators, likewise, has not endeared heavy nymphing to purists.

I'm not going to pretend that this is the apogee of the graceful long-rod sport or a technique that works all the time on all rivers. Or even some of the time on some rivers. But it *will* work, and work very well, on most Appalachian streams about the time you're reading this — in April. I'll even go so far as to say it is the *most effective* way to fly fish our mountain streams in the high, fast water of late winter, early spring.

Before I get to the rules, let's define the playing field and quarry. Small-stream Appalachian trout are by nature extremely spooky, but once the water temperature tops 40 degrees or so by April, they're hungry spooks.

Rainbow Trout *(Oncorynchus mykiss)*

The fish have emerged from their winter torpor and will take food or fly on top, but the majority of the action is still underwater. Most of the hatches haven't begun in earnest yet, but the nymphs of mayflies and stoneflies and the larvae of caddis are becoming active, moving about and preparing for their last fling in the sun. The streams are as ripe with nymphs as they'll be all year.

In the early spring, the tumbling freestone streams are built to order for the heavy nympher. The character of different Appalachian streams will vary with their size and the gradient through which they flow, but most hold water suitable for nymphing. What you're looking for are eddies behind boulders, current tongues where fast water meets slack, the heads of plunge pools and riffles, and deep slots between rocks. Trout will also be deep in that cushion of slower water produced as the current flows over the boulder-strewn bottom.

In short, they'll be anywhere that assures them of two things: shelter from strong currents and a steady food supply. Most years, spring water conditions will be high and fast — and sometimes roily — and the resulting foam, chop and bubbles produce the broken water surfaces that allow the careful nympher to sneak close enough for his dirty work, and close you'll need to be.

I believe the most important ingredients for successful heavy nymphing are proper line control and keeping yourself hidden from the trout. Seems simple enough, but easier said than done. Fly selection, casting ability and pinpoint accuracy are also important, but secondary.

Proper camouflage means using natural cover and wearing the right clothes. Spare me the fuchsia vests and the designer fluorescent hats. A camo chamois shirt and rhododendron green vest works better, trust me. And a camo cap to top it off. Smirk now, but pass the measuring tape later. A stealthy approach is even more vital. Stalk a pool or trouty piece of water like a starving man would, as though you *needed* to eat the fish you catch.

Accuracy with heavy nymphing means keeping your fly out of overhanging branches, not necessarily exacting placement. Because of the water conditions, you usually won't spook a fish holding in fast water if your cast is off a bit. The motto "try and try again" comes to mind. In fact, "classic" nymphing water — the deep and fast runs — usually requires repeated drifts. I've pitched nymphs up to 15 times through the same slot before hooking up with Mister Salmo. Casts should be made several feet upstream from the spot where you expect a fish to be, allowing nymphs time to sink to the proper depth. Proper depth, for me, usually means scraping the bottom, but more on that later.

As I've said, heavy nymphing doesn't make for pretty casting. Fortunately, long distances are rarely needed on Appalachian water. Moreover, casts over 20 feet usually put too much line on the water, producing excessive slack that's easily grabbed by conflicting or

Brook Trout *(Salvelinus fontinalis)*

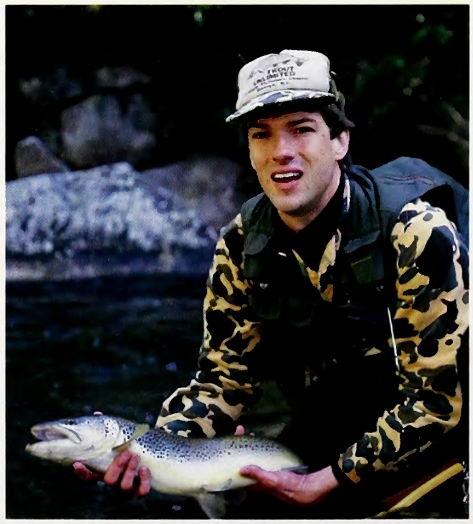
crossing currents. That causes the nymph to drag unnaturally. If I've got one piece of casting advice, it's to slow your casting rhythm down and let the rod load properly. With lots of lead on your leader, you'll find your casts are more lobs or flips than true casts. That's fine. Function, not form, is what really counts. When you hear that big stonefly nymph whistling by your ear, instead of snagging it, you're on the right track. Chuck and duck, as they call it out West.

Mostly, you'll be casting upstream, or at least up and across, and this is where line control *on the water* becomes critical. Control begins with your casting position, and you should be in a place where you can manage the drift without spooking the fish. If you do the sneaky bit right, you can get pretty close to trout holding in fast water because they can't see you as well through the foam and white-water ripples. Reading the water correctly is really a matter of experience, of knowing how close you can get to a particular type of water without spooking the fish.

As the fly drifts back, you'll want to keep as much of the fly line off the surface of the water as possible. Ideally, you've got an inch or less of fly line on the water, your rod held high, and your free hand stripping in slack line as the fly drifts back. Make that stripping line in *furiously* if the water is fast. This is where the long rod really comes in handy. I use a 9-footer rated for a 4-weight line. Actually, the rod — made of Graphite III — is powerful and fast enough to cast a 5-weight line handily. For dry flies, I fish a 4-weight double taper. When I nymph, I simply change to an extra spool filled with weight forward floating 5-weight line.

I once fished with Pennsylvania's Ed Schenk, a true master of the short light rod. He performed some amazing things on the Letort with a little 6-foot, 3-weight rod, but then, that's not me or anyone else I know. Because nymphing requires a certain close proximity to your quarry, I've found the long rod's extra inches helpful. There's a tradeoff here, of course; the long rod being somewhat cumbersome on small streams with overhanging branches. It's a tradeoff I'm willing to make. After all, if there was one perfect small stream rod, why would rod companies make so many different types?

Leaders are important. For weighted nymphing, I think leaders between 6 and 8 feet are optimum. Anything longer and you lose some line control. Early season, taper tippets down to a 3x or 4x. Later in the season you can go lighter if low water conditions require it.



This brown fell *to a weighted golden stonefly nymph fished deep on the bottom in late March. What nymphing lacks in artistic grace it makes up for in effectiveness, especially in the high, fast streams of early spring.*

There are two good reasons for you to tie your own leaders. First, your friends will be impressed. Secondly, your leaders will cast better, are cheaper and allow for easier on-stream repair. I like stiff mono for the butt section because it turns the fly over better while a softer material at the tippet gives the nymph a more natural, deeper drift. There are a lot of leader formulas and kits out there; I like those sold by Harry Murray in Virginia because they've been designed for Appalachian water.

Concerning the nymphing game, nothing has driven dry fly purists and their ilk to apoplexy more than the use of strike indicators, especially those manufactured from synthetics, and particularly those made of foam (obligatory gasp!). Personally, I've found that roll-on foam indicators — when placed at the juncture of the fly line and leader — float heavily weighted nymphs very nicely. I've gone one step farther by painting my leader knots fluorescent orange, then coating them with Flexament.

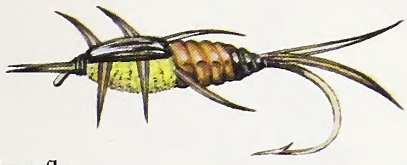
The painted knots form a descending line of mini-indicators. These greatly aid in strike detection. Not only do they allow you to see the slightest hesitation in your line underwater, but they remove the need for adjusting and moving your strike indicator up and down the leader as water depth changes. You simply hold as many painted knots above water as stream conditions dictate. The painted knot indicator system, I should caution, can spook angler-wise fish on heavily fished tailwater rivers or spring creeks.

Detecting the strike is the really tricky part about nymphing. When your line or indicator hesitates, strike — not hard but fast. A quick lift of the rod tip should do. Sometimes it will be a fish, sometimes the bottom. Don't ever

Southern Appalachian Nymph Patterns

Yallarhammer

Perhaps North Carolina's most famous fly, the original version of the Yallarhammer is now illegal. Though once tied with the feathers from the protected flicker, modern tiers now substitute yellow-dyed dove or quail feathers. "This is a real old traditional pattern that we've modified so we can make them with legal materials," Dwight said. "We tie a lot of them. It's a real pretty fly that will catch a lot of fish. It'll catch a fisherman's eye, too."



Superfly

This heavily weighted stonefly imitation is a trophy-snatcher from deep pools and fast runs. "I catch more big trout on the Superfly than anything I've ever used," Dwight said. "Now, I don't catch as *many* fish with it as some flies. But when the water comes up or I'm after a big trout, this one will get them."

Yellow Stonefly

This slender-bodied nymph is a modified Polly Roseborough pattern. "We weight this lightly and fish it in the calmer waters," said Dwight. "It's not a real rough water fly. It works well all year, but it seems especially effective in May and June."

Don's Stonefly

The Howells tie this nymph in several colors to imitate the various stonefly species found in Appalachian waters. "This is a pattern we came up with," said Don. "We tie it with a woven body to get the segmented effect."

The Black Nymph

The Black Nymph was originated by the late Fred Hall, a commercial fly tier in Bryson City. "It's a super fly on rainbows," explained Don. "For some reason rainbows seem to like it better than the browns. We use it in the Smoky Mountain streams a lot."

Sheep Fly

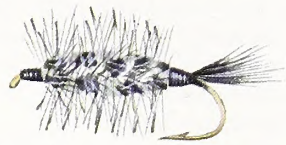
Nondescript but deadly, the Sheep Fly is another homegrown Tar Heel nymph. Invented by Newland Saunders and popularized by Cap Weise — two old-time North Carolina trout fishermen — the Sheep Fly is one of the Howells' favorites. "We've caught more trout on the Sheep Fly than just about any fly we use," said Dwight. "It's a dandy fly."

"We tie it heavily weighted in the bigger sizes and fish it close to the bottom," Don explained. "We've taken everything on this fly — crappie, carp and bass."

Tellico

Along with the Yallarhammer, the Tellico is one of Appalachia's most famous nymph patterns. It probably imitates a stonefly. "This is an old Tennessee pattern," said Don. "It's a real good producer on just about any stream, any time of the year."

It seems to work the best when the water is just a little off color in the spring," added Dwight.



G. Neils Daniel

The G. Neils Daniel was named after a customer in Greensboro who asked the Howells to tie the pattern for him. A derivative of the Strawman nymph, Dwight said it is one of his favorites. "It's one of the best," Dwight said. "It was originally designed to catch bream, but we've found it to be an excellent trout pattern, too. I'd rate it up there next to the Sheep Fly in fish-catching ability."

Hot Creek Special

Another Howell pattern, this peacock-bodied nymph was designed to fish the low water and "hot creeks" of mid-summer. "We tied the Hot Creek Special to fish the South Toe River when the water got down in July and August," said Don. "It's deadly then. We don't weight this one too heavily and we fish it suspended. We think it imitates a beetle."

Although anglers have fished for trout in North Carolina's mountains since early settlement, very few Appalachian fly patterns used on these streams have become popular outside of the region, the Tellico nymph being a notable exception. There are probably several reasons for this, both societal and biological. No doubt, it's partly because of Appalachia's long-standing isolation and poverty, as well as its lack of large urban centers and a corresponding urban "leisure" class. In other words, trout fishing was traditionally a method to provide a meal for a needy family, not a sport to be deified.

Appalachia has modernized, of course, but freestone Appalachian streams are still characterized by their paucity of aquatic life. Unlike fish in richer waters, Appalachian trout rarely have the luxury of being selective. They eat what's available or they go hungry. Hence, an effective Appalachian trout pattern is often an attractor fly that looks like something good to eat, rather than being strictly imitative of one particular species of insect.

Wildlife in North Carolina asked a pair of well-known Appalachian commercial fly tiers, Dwight and Don Howell of Brevard, to reveal what they believe makes for an effective Appalachian nymph pattern.

"With limited aquatic insect life in our streams, I like to tie a buggy, bushy fly to attract the trout," Dwight explained. "Most of the flies are attractors except for the stoneflies. Yellow is always a good color. You ask any old-time trout fisherman from western North Carolina or east Tennessee, and he'll tell you to use yellow. Trout just seem to like it. Anything with a peacock body is good, too."

"We're also real fond of rubber legs on our nymphs," added Don. "I think a trout sometimes follows a nymph until he sees those legs moving and then he jumps on it."

Veteran tiers of almost four decades, the Howells use a blend of traditional and new materials. Their flies are very effective.

expect to hook every fish that may have taken your nymph. It only takes a trout perhaps a second and a half to take and spit out your decidedly untasty imitation. If you fish nymphs enough, you eventually develop a "sixth sense" about the whole affair. You'll find yourself striking before your line shows visible signs of a strike. Or you will develop the ability to anticipate when a fish should bite. Lift the rod. *Thung!* He's on.

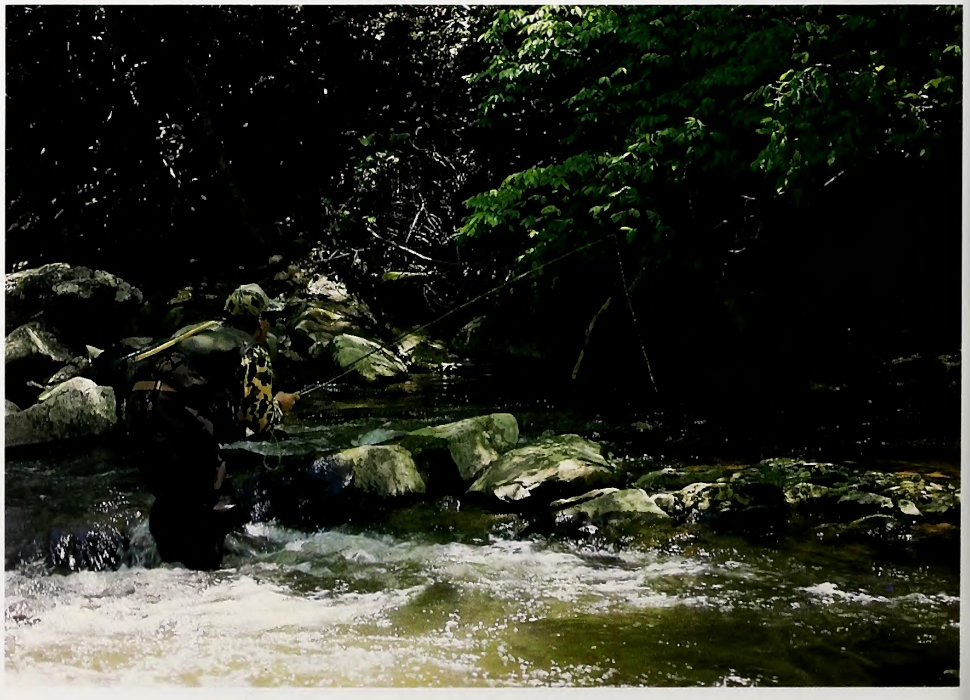
With some exceptions, I've found the downstream wet fly/nymphing tactics to be of limited use on "typical" Appalachian streams. The water is usually too small, the pools or runs too short and the trout too spooky to be approached from above. Take note that I said *usually* and not *always*. On bigger streams, your best approach will sometimes be from the sides of a deep run, rather than from its tail. Here, lower your rod tip as the line swings past you and let the current straighten the line and lift the nymph off the bottom. The rising fly perfectly simulates an emerging nymph and trout will positively jump it.

As for the correct amount of weight, I follow a simple rule: if you're not losing some nymphs on the bottom, you're not doing it right. I learned this at the head of a deep—I mean *deep*—run on Canada's Bow River in Alberta. After drifting a big Brooks stonefly through the run several times, my guide looked at the three BB-sized split shot on my line and told me emphatically, "You ain't got enough weight on."

He proceeded to attach a large weighted olive wooly bugger—about the size of most of the brook trout I'm used to catching—to a short section of 1x leader that ran from the tip of his sink-tip line. To this he added four or five grapeshot-sized split shot. This he heaved several feet in front of the run. As it plunged to the bottom, I watched the line come alive. The floating portion above water danced with short little jerks as the mega-nymph *tic-tic-ticked* across the rocky bottom before a good portion of it disappeared with a solid *yank*.

A 22-inch long "yank" as it turned out. I promptly lost my re-weighted nymph on the bottom, but not before catching that rainbow's 20-inch cousin.

While sink-tip lines are seldom a requisite on Appalachian streams, lead is. I carry three types: micro-shot, removable BB split shot and lead putty. Lead putty is great because it's easy to add or remove depending on the depth of water you need to fish. Problem is, it tends to fling off easily or slide up and down your



***Stealth, camouflage** and proper line control are the keys to successful nymphing on Appalachian streams. You will not catch a fish that sees you, so use available cover to stay hidden.*

Brown Trout (*Salmo trutta*)

leader. To counter this, I place one micro-shot —the smallest I can find—on my leader about 12 to 15 inches above my fly. This forms a solid anchor to which you can mold as much putty as you like.

When I get to a serious run with blue green water whipping fast and deep through a slot, I'll go to the removable BB shots. They cast better than the putty/microshot combo and sink faster too.

A word about nymph patterns. I, too, enjoy playing the erudite, wine-sniffing Latinizer type, but when I'm confused as to whether the mayfly nymphs in my sampling net are *Stenonema vicarium* or *Stenonema fuscum*, I remember these very simple, very non-Latin names: Tellico, Zug Bug, Hare's Ear, Pheasant Tail. Sizes 10 to 16. If your entomological vocabulary extends no farther than this, you'll do all right, at least until the water gets low in the summer.

The Hare's Ear will pass for any variety of mayflies, stoneflies or caddis, depending on color and size. The slender Pheasant Tail is great for imitating dark swimmer mayfly nymphs like the *Baetis*. I'm not sure about the flashy peacock herl Zug Bug, but fish love peacock-bodied nymphs. The Tellico? Could imitate the little yellow *Isoperla* stonefly. Then again, might look like a Jolly Green Giant Niblet, too. Whatever—it's deadly.

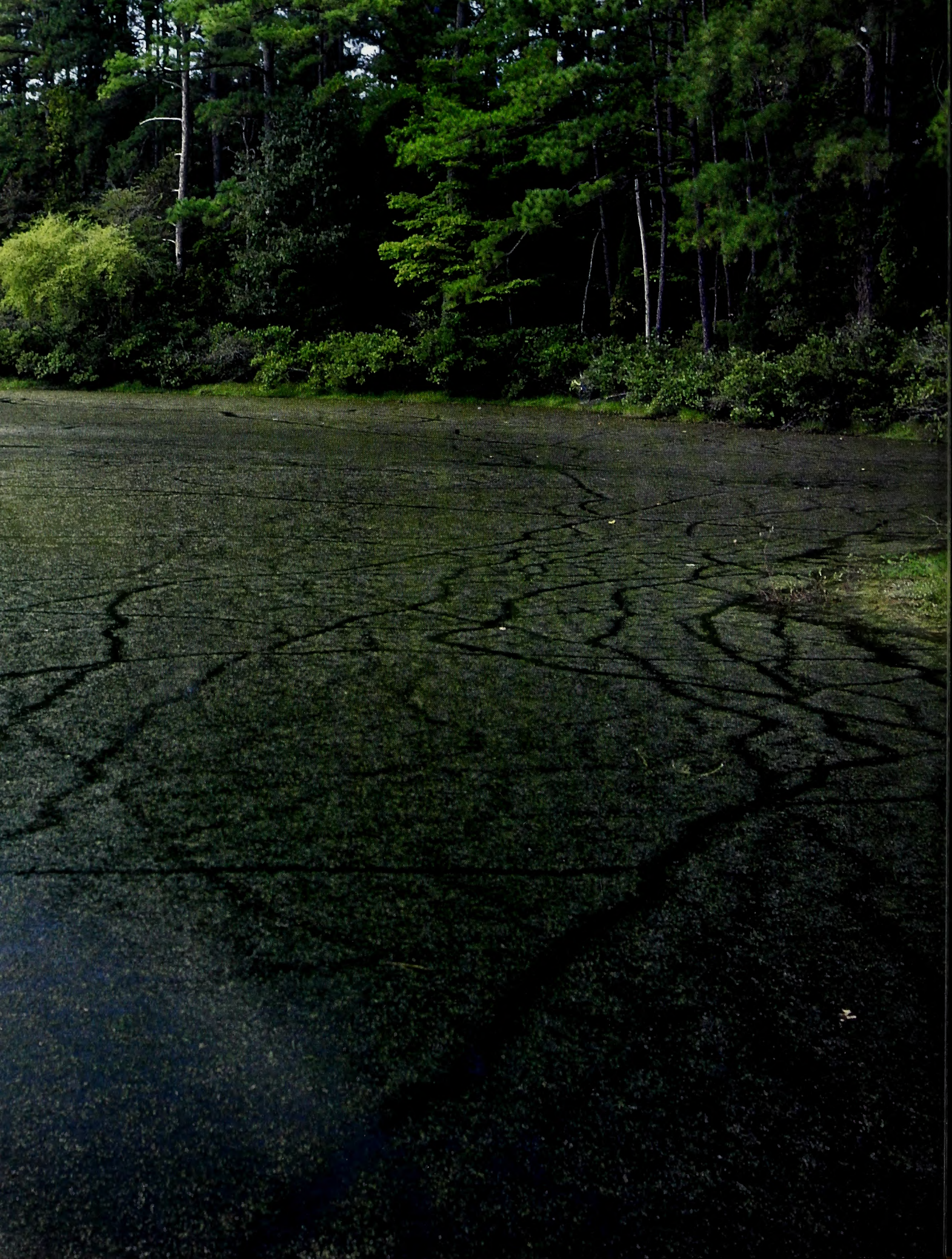
Speaking of stoneflies, don't forget 'em. Little Black, Big Brown and Golden Stone. Early spring is their time of the year. Choose sizes 6 to 10 and tie them weighted. A properly fished Wooly Bugger is another piscatorial vacuum cleaner. Okay, I know it's technically a streamer but you can dead drift it just like a nymph. The best thing about the wooly bugger is that it's so hard to fish *improperly*. If you're nymphing with it and you get a little unwanted underwater drag, you've got an instant sculpin, dace or other trout goody.

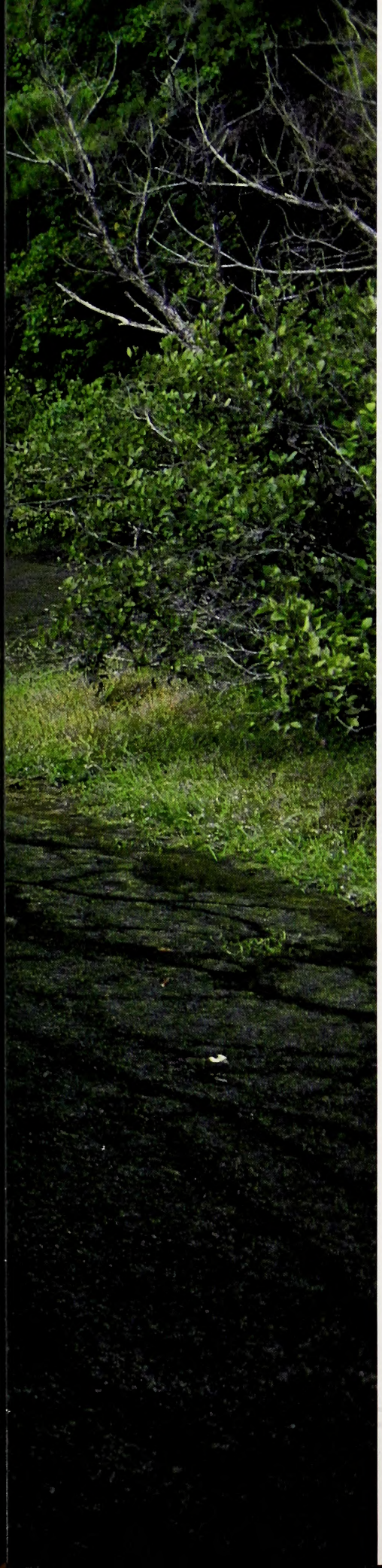
Despite my nymphotic preferences in April, it's not the only way to catch fish this time of year. You *can* get into some good hatches, particularly the Hendricksons, Yellow Sally's and olive caddis. There's also other water—the quiet glides, glassy pools, shallow riffles—where heavy nymphing is much less suitable. Try to short-line nymph this and all you'll do is spook fish—perhaps the trophy of the day. Be versatile—carry an extra spool of line with a dry fly leader attached and go for it. You can also fish in tandem. Your partner fishes dry, picking the dry fly water. Nymph water, your shot. That's a good way to determine which tactic will be more effective that day.

By now some of you old-fashioned types may be saying: "Yes, it's effective fishing but is it *fly fishing*?"

Well, you're using a fly rod and reel, a fly line, and an artificial fly, aren't you? ☒

Trout and flies were painted by Robin Ade, a British fishing writer and artist, while he was visiting North Carolina. Robin writes and paints regularly for Salmon, Trout & Sea Trout, *a United Kingdom angling magazine. He is the author of* Fisher in the Hills *and* The Trout and Salmon Handbook. *He makes his home in southwest Scotland.*





Plants That EAT Lakes

Hydrilla and alligatorweed are two of the exotic plants getting a chokehold on North Carolina's waters, and that could hurt fishing.

written by Keith W. Ashley
photographed by Ken Taylor

Bass fishermen aren't likely to forget the way Eurasion water milfoil turned Currituck Sound into a 40-mile-long bowl of salad in the late 1960s and early '70s. An exotic aquatic plant, milfoil was introduced into the sound accidentally where it soon displaced many native plants. Equally bad, its huge, thick mats of weeds clogged transportation and made fishing difficult. Salt intrusion and a natural dieoff have helped control the milfoil, but North Carolina's waters are now facing far more serious long-term aquatic weed threats.

The two worst culprits are hydrilla and alligatorweed. Both are exotic species that have already become major problems in some waters, and they are rapidly spreading and strangling other bodies of water with their choking mats of vegetation. Where these weeds become established, they threaten water supplies and replace beneficial native plants. If not controlled — and control is very difficult — these weeds can virtually bring all boating and fishing to a standstill even on many huge impoundments. If you can imagine vast expanses of your favorite lake becoming a totally unfishable wad of weeds, it's easy to understand why biologists are worried.

Of course, not all aquatic weeds are harmful. To a great extent, it depends upon whether the plant is native to the United States or an exotic from another country. Many native aquatic plants, such as pickerelweed, vallisneria and American elodea, are beneficial to fish and wildlife. They provide food and protection to forage and game fish, aquatic mammals, waterfowl and aquatic insects and other invertebrates. They enhance the aesthetic appeal of many waters and help maintain good water quality in others by absorbing excess nutrients and preventing unsightly algal blooms. Such native aquatic weeds rarely become a problem unless the water body has fairly large expanses of clear, shallow water and there is a high input of nutrients such as nitrogen and phosphorus. In most bodies of water, phosphorus tends to be the factor that influences growth.

***Hydrilla has formed** such a dense mat in Lake Anne that fishing and boating is no longer possible in many parts of this Wake County lake. Since this aquatic weed was first introduced into the state, it has rapidly spread to other bodies of water, especially in recent years.*

Sweetwater Creek, *a tributary to the Roanoke below Williamston, is the site of perhaps the densest growth of alligatorweed, another introduced species that may be as big a threat as hydrilla. Spraying aquatic herbicides provides short-term control at best and can be expensive.*

While many species of native aquatic plants are beneficial and have sufficient natural controls to limit their growth and abundance, most exotic plant species lack these natural controls. Without natural controls, exotics such as hydrilla, alligatorweed, egeria (Brazilian elodea) and Eurasian water milfoil may spread unchecked. Even some native plants — variable-leaf milfoil, proliferating spikerush, duckweed and filamentous algae — have the potential to cause problems in small lakes and ponds.

Of these exotics, however, it's hydrilla that poses the biggest problem. Hydrilla is native to Africa and was probably introduced accidentally to the United States during the 1950s by the aquarium trade. It has few natural controls in our waters and also has the ability to grow extremely well at low light intensities over broad ranges of temperature and water quality. Depending upon water clarity, it can grow in depths ranging to 15 feet or more. Once it reaches the surface, hydrilla forms dense mats that shade the water below and affect natural aquatic communities. Hydrilla's ability to use low levels of light and carbon dioxide for photosynthesis allows it to displace many native plants.

Even a small, single fragment of hydrilla can quickly multiply into a tangled mass of weeds covering acres. Hydrilla's growth potential is perhaps best exemplified by what occurred in Rodman Reservoir, Florida, after its introduction in the early 1970s. Hydrilla covered two acres of the more than 13,000-acre reservoir in 1971 but quickly spread to cover nearly 3,000 acres by 1975. According to Dr. Dave Sutton (University of Florida, Ft. Lauderdale), one tuber from a hydrilla plant produced about 160 pounds of vegetative growth and left 6,046 tubers in the soil after only four months of growth. Currently, Florida is spending between $10 and $12 million per year on aquatic weed control, mostly to control hydrilla.

Boaters find it impossible to navigate through hydrilla infestations because props and water intakes become clogged. Unfortunately, some fishermen have intentionally introduced hydrilla to lakes or ponds because they mistakenly believe that the weed can improve game fishing in an area by providing

additional cover and nesting sites for largemouth bass. However, the result is quite the opposite. Forage fish become overpopulated and stunted, and gamefish populations decline because they are unable to capture prey effectively in the thick cover. Eventually, it becomes virtually impossible to fish lakes and ponds when hydrilla coverage exceeds 25 to 35 percent of the surface area.

Hydrilla also poses special problems for farmers. Because the plant tends to act like a big sponge, it can reduce available water supplies by as much as 40 to 60 percent. Already, it has blocked miles of irrigation and drainage ditches in California and Florida.

Those who think hydrilla is only a distant threat in North Carolina simply haven't kept up with its rapid spread since 1981. A hydrilla survey conducted during that summer by the Division of Plant Industry of the N. C. Department of Agriculture revealed 11 lakes in North Carolina with hydrilla infestations. All were located in Wake County near Raleigh and the total coverage was less than 200 acres.

"The hydrilla survey was repeated in 1989 and the results were alarming," said Dave DeMont, administrator of the Aquatic Weed Control Program for the State's Division of Water Resources. "Hydrilla now infests 48 water bodies in North Carolina, covering about 1,257 acres of lakes and ponds," he said. This represents more than a sixfold increase in area coverage and more than a fourfold increase in the number of bodies of water infested since 1981.

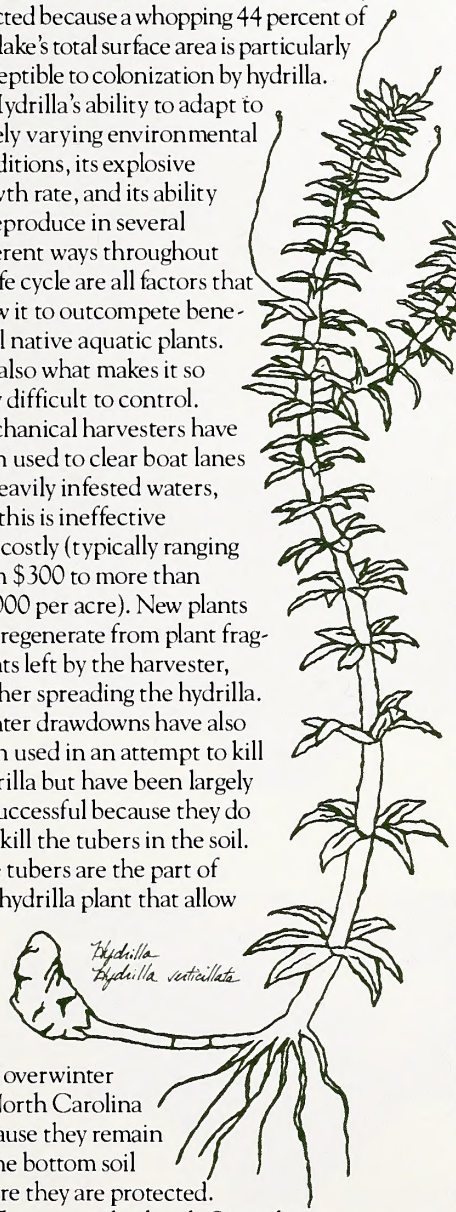
Currently, hydrilla distribution in the state is best described as a dense concentration of infested sites near Raleigh surrounded by six separate and remote areas of infestation. It has been found as far north as Lake Gaston on the Virginia state line, as far west as Asheville, and as far east as Burnt Mill Creek in Wilmington.

How does hydrilla spread from one body of water to another? Unfortunately, it's easy. Aquatic birds and mammals can transport plant fragments upstream, downstream, or even into adjacent drainages. Long-distance transfer often occurs through the sale of ornamental aquatic plants by the aquarium trade. Most short-distance transfer of hydrilla, however, probably results from boating activities. Very often hydrilla first appears in a reservoir or lake near a boat ramp because it is easily carried on propellers, boat trailers and in live wells. Wake County, for example, has 35 distinct infestations of hydrilla that are probably the result of transfers by people and/or waterfowl.

"The hydrilla infestations that pose the most serious problems in North Carolina are located in Wheeler, Benson, Gaston and Harris lakes," said DeMont. Wheeler and Benson serve as water supplies for the town of Garner and about half of their combined 500 acres are infested with hydrilla. Hydrilla has also been found growing throughout the entire length of Lake Gaston, and although it does not pose a serious problem yet, it is expected to increase its coverage significantly within the next few years.

The 1989 survey revealed that hydrilla has also become established in Ledge Creek, a major tributary entering Falls Lake. It has been found growing about 3 miles upstream from the lake, increasing the likelihood that Falls Lake will soon become infested with this noxious weed. Should this occur, the Piedmont regions water resources could be seriously affected because a whopping 44 percent of this lake's total surface area is particularly susceptible to colonization by hydrilla.

Hydrilla's ability to adapt to widely varying environmental conditions, its explosive growth rate, and its ability to reproduce in several different ways throughout its life cycle are all factors that allow it to outcompete beneficial native aquatic plants. It is also what makes it so very difficult to control. Mechanical harvesters have been used to clear boat lanes in heavily infested waters, but this is ineffective and costly (typically ranging from $300 to more than $1,000 per acre). New plants can regenerate from plant fragments left by the harvester, further spreading the hydrilla. Winter drawdowns have also been used in an attempt to kill hydrilla but have been largely unsuccessful because they do not kill the tubers in the soil. The tubers are the part of the hydrilla plant that allow it to overwinter in North Carolina because they remain in the bottom soil where they are protected.



The aquatic herbicide Sonar has successfully controlled hydrilla in small ponds but has received limited use due to its extremely high cost. Two other aquatic herbicides, Diquat and Aquathol, are less expensive than Sonar and are also effective at controlling hydrilla but may require more frequent treatment. Even so, the tubers are not affected by herbicides because they remain covered with mud.

Biological control of certain species of aquatic plants, especially submerged plants such as hydrilla, has been achieved by stocking sterile triploid grass carp. Grass carp can eat two to three times their own weight in aquatic vegetation daily and can reach weights approaching 40 to 50 pounds in North Carolina.

In August 1984, the Wildlife Resources Commission began permitting the use of certified sterile triploid grass carp for biological control of aquatic vegetation. "Diploid" or non-sterile grass carp are illegal in North Carolina. Pond owners who stocked grass carp were surveyed in 1987 to determine types of aquatic vegetation controlled and to evaluate stocking rates. Grass carp were found to control some pond weeds and algae (musk grass), as well as hydrilla, proliferating spikerush, naiads, bladderwort, coontail, elodea and parrot's-feather. These plants can generally be described as submerged aquatic plants with filamentous, relatively delicate stems. The carp did not, however, control alligatorweed, watermeal, vallisneria, Eurasian water milfoil, smartweed, American lotus, yellow waterlily, fragrant waterlily, maidencane, watershield or cattails. These plants are generally characterized as emergent or floating leafed aquatics with sturdy, woody-like stems.

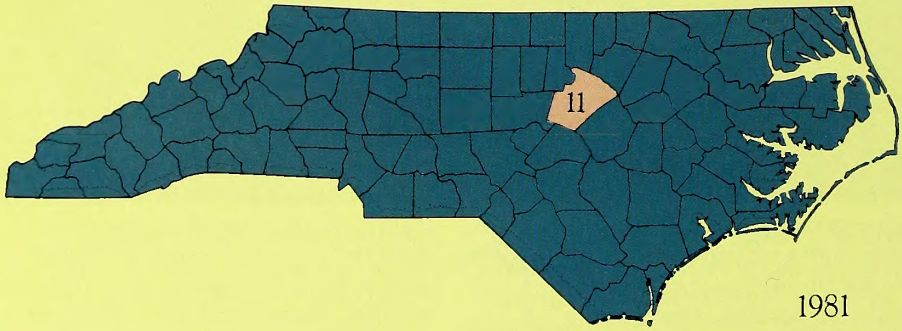
A permit is required before carp can be stocked in ponds larger than 10 acres, but it is not required for smaller ponds. An application for a permit can be obtained by calling the Commission at (919) 733-3633. A maximum of 15 grass carp per vegetated acre should be stocked into ponds less than 10 acres in size. The Commission recommends stocking carp at rates of 10 to 20 carp per vegetated acre for ponds larger than 10 acres. Larger fish 8 to 12 inches are stocked to reduce loss from predation by largemouth bass, birds like ospreys and great blue herons, and other predators. Stocking rates for partial control have not been scientifically established. Since there is concern about the downstream impacts of escaped fish, triploid grass carp are not permitted for use in large multi-purpose lakes or reservoirs where aquatic vegetation is desirable for gamefish and waterfowl habitat.

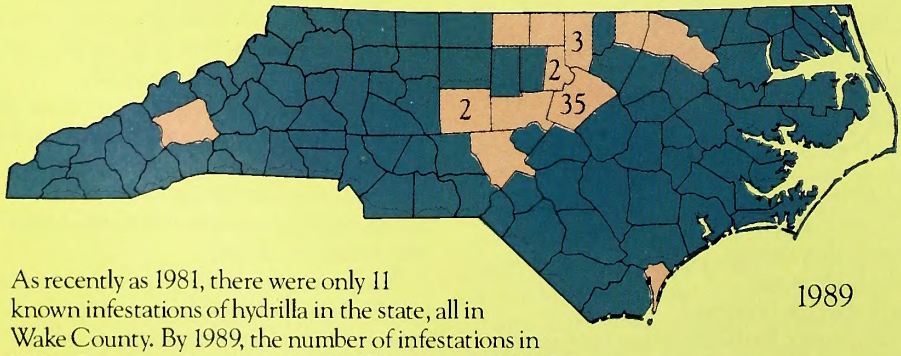
Thousands of grass carp have been stocked into farm ponds across the state to control aquatic vegetation, and most pond owners have been pleased with the job they have done. However, since triploid grass carp merely control some undesirable weeds in smaller bodies of water, this solution has obvious limitations.

Carp are not effective in controlling alligatorweed, and this exotic aquatic weed

***In places along** Sweetwater Creek, alligatorweed has almost totally blocked the channel preventing fishing and boating. Unlike hydrilla, alligatorweed can even become established on land where it can be equally devastating.*

Hydrilla Spreading Rapidly





As recently as 1981, there were only 11 known infestations of hydrilla in the state, all in Wake County. By 1989, the number of infestations in Wake County had increased to 35. Worse, hydrilla had spread rapidly with three infestations found in Granville County, and two each in Durham and Randolph counties. Chatham, Moore, Person, Caswell, Warren, Halifax and Buncombe counties each had one infestation. No doubt, hydrilla has spread even further since 1989's survey.

may pose an even bigger threat than hydrilla because it is capable of growing on both land and in water. Alligatorweed was introduced to the United States from South America in the late 1800s and is classified as an emergent aquatic weed (rooted on the bottom with a portion of the plant extending above the surface of the water). But it can form dense free-floating mats that often block irrigation ditches and drainage canals. Complete coverage of large areas by these dense mats may also result in fish kills caused by anoxic conditions under the mats. Like hydrilla, it also reproduces by fragmentation, making it difficult to control.

Already, alligatorweed has infested thousands of acres throughout the Coastal Plain, and it can be found growing as far west as Guilford County. Because alligatorweed is capable of growing on land, it can quickly spread into nearby agricultural fields. Once it becomes established on land, it is almost impossible to control and can outcompete such economically important commercial crops as soybeans and peanuts.

"Pond owners who have serious problems with alligatorweed growing in water can control it with the use of aquatic herbicides," said Dr. Stratford Kay, an aquatic weed specialist in the Crop Science Department at N.C. State University. Two insects imported from Argentina — the alligatorweed flea beetle and the stemboring moth — have also provided some control of alligatorweed, but their potential is likely to prove limited in North Carolina.

Another aquatic weed pest threatening our waters is egeria, a submerged aquatic weed, which can be found growing rooted

***Hydrilla and other** undesirable non-native aquatic weeds may have gotten a foothold here when aquarium enthusiasts "liberated" extra plants that grew quickly. These plants can be spread by many means, however, and sprigs have been accidentally carried from one lake to another on boat trailers.*

to the bottom or as a free-floating plant. It grows rapidly and forms dense surface mats like hydrilla, causing many of the same problems. These plants are very similar in appearance, and it is difficult to tell the difference. This species is also probably the most popular aquarium plant in the United States today, sold in tropical fish stores under the name *anacharis* or oxygen plant. Unlike hydrilla, however, egeria can be controlled with water-level drawdowns.

At this point, you may be wondering exactly what, if anything, you should do about aquatic weeds. That depends upon whether the problem exists in private or public waters. For public waters, you can report potential aquatic weed problems, or learn more about threatening weeds, by calling the N.C. Division of Water Resources in Raleigh at (919) 733-4064. Ask for the Aquatic Weed Control Program.

On private waters, the first step for a pond owner is to seek qualified help to identify the weed or weeds. The weed must be correctly identified in order for any controls to be effective. Private pondowners who have a problem should contact their local County Agricultural Extension Agent. The extension agent will identify the weed and make management recommendations. Some weeds do not respond well to herbicides while others can be controlled with less costly means such as water-level drawdowns or biological control agents. Since most noxious aquatic weed problems will not disappear by themselves, landowners should not wait until the weed completely covers a pond before seeking assistance.

On both public and private waters, you can help prevent the spread of weeds by completely removing any vegetation from boats, motors, trailers and live wells before leaving a boating access area. And, of course, you should never intentionally introduce any aquatic vegetation into lakes, ponds, rivers or streams. That little weed could wind up "eating" your lake, destroying your water supply and ruining your fishing. ☒

Noisy Spring

Open beaks and begging chirps signal the ancient renewal of life among what must surely be earth's most cherished creatures.

written and photographed by Harry Ellis

There are few among us who are not stirred and fascinated by birds—perhaps by the clatter of wild geese drifting across the sky, or a wood thrush singing in the green twilight, a Maytime marsh alive with red-winged blackbirds, or the caroling of robins in the cool dawn of an awakening day. Much of our poetry and our art is inspired by birds. From an economic standpoint, it is doubtful if modern agriculture could survive the onslaught of the insect hordes without the aid of birds.

Once again the vast avian armies are winging their way northward as all the land unfurls a floral welcome to greet them. We sometimes wonder why these birds leave tropical lands of hospitality and abundance where they have spent the winter and fly thousands of miles over jungles and mountains, deserts and oceans, to place their nests and eggs in what to us would seem a far less favorable environment. Yet each vernal season brings them back to us with a precision that is amazing. Obeying an ancient instinct, they are impelled to reproduce their kind in ancestral breeding grounds of the north. Most ornithologists consider the place where nesting occurs to be their true home.

With the departure of the birds in autumn and the falling of the leaves, there is a melancholy mood of desolation, but when the first migrants return in the spring, our spirits are lifted for we know that winter is past and another spring is upon us. By a single revolution of the wheel of life, the earth is reborn. The bud opens, the seed sprouts, the grass blade reaches toward the sun and the egg hatches. Along with this great seething uproar of life, there is a thankfulness in our hearts at simply being alive to see it all happen.

The feathered tribes return to every dooryard, woodland, marsh and meadow—robins, bluebirds, redwings, thrushes, tanagers and all the rest in bright, new plumage with throats full of song. Some come from thousands of miles away, others but a short distance, no farther than our southern states and Gulf Coast. Many come back to the very spot where they nested the previous year. Phoebes often return to the underside of the same bridge where last year's brood was reared to build their nests, a fact attested to by aluminum leg bands that are used to chart their courses. Generally, birds time their arrivals to coincide with the hatching of beetles, grubs and caterpillars, upon which they depend for food. Robins return just about the time the frozen earth is thawing and earthworms are migrating to the top of the ground.

On certain mornings in early May, when spring migration is at flood tide, the trees around my place are alive with warblers. These feathered jewels have arrived fresh from tropical lands that I shall never see, stopping for a short rest and refueling before continuing their journeys to nesting grounds lying northward over many horizons. Some of them, however, will go no farther than our mountain valleys and summits to nest and rear their young.

Pondering the riddle of migration, I marvel

Cedar waxwings *have erratic nesting behavior, usually locating their solitary nests near a source of berries and fruits in our higher mountains. They are more often seen, however, in passing flocks that can quickly strip a tree of berries.*

at the mysterious inner sense that guides their wings over distant courses that no man could follow without precise navigational equipment. Thousands of facts have been assembled regarding the migration of birds, but as to its origins we can only surmise, for its beginnings are buried in geological epochs.

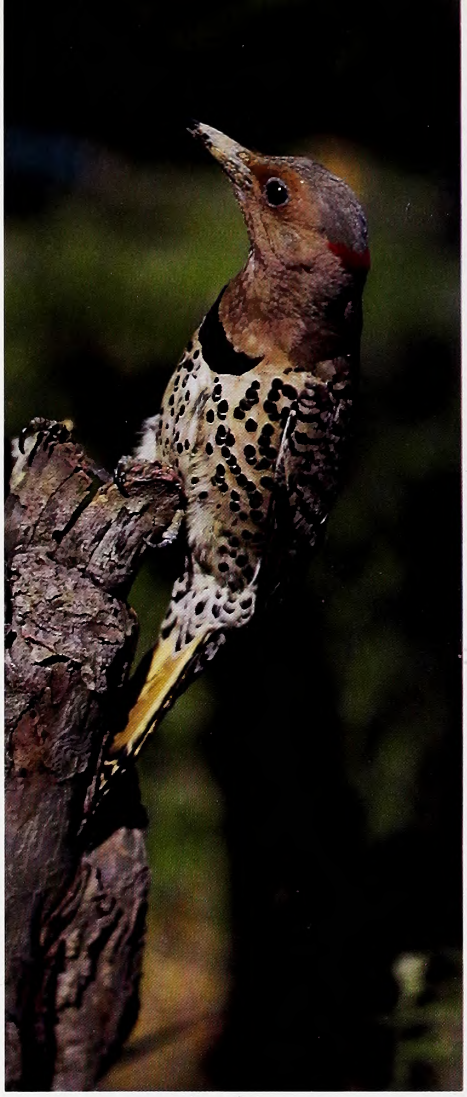
Most of the earliest arrivals are males. They come north ahead of the females, each to claim a small territory over which it will preside, fiercely guarding it against all others of that species; property lines are established by song. A singing bird is not just announcing to the world its joy of living. The song of the male—females normally do not sing—has a twofold purpose: to proclaim and hold a territory, warning other males to keep out, and to attract and court a female. If she takes the male for a mate, she also accepts the kingdom that he has chosen.

Some birds that do not sing defend territories and attract females by other forms of behavior. For example, the male ruffed grouse pounds the air with his winds to produce the familiar drumming thunder. Flickers and other woodpeckers hammer the hollow limbs of dead trees to make a noise that can be heard over long distances.

In the world of nature, there is nothing more delightful or long remembered than the songs of birds. I would nominate the wood thrush and the mockingbird as the two outstanding songbirds of the Western Hemisphere, with the beloved robin not far behind. The white-throated sparrow, another of my own favorites, sings to us briefly in its migratory passing of "Sweet Canada! Canada! Oh Canada!" That's where it goes to mate and rear its young.

In his *Ornithological Biography*, John James Audubon declared that "The wood thrush is my greatest favorite of our feathered tribes. To it I owe much. Often when I have listened to its wild notes in the forest, it has revived my drooping spirits."

Mockingbirds sing almost constantly throughout the day and often at night when there is a full moon. They imitate other birds and also have a range of beautiful melodies of their own. Sometimes as I listen to them, memory carries me back to my boyhood and the birds that sang to me when the future seemed to stretch out forever. Today as I listen, I know I have heard the same song before, just as the voice of Keats' immortal nightingale had been "heard in ancient days by emperor and clown." There is nothing like the changeless song of a bird to carry a man back home.



***This common or** yellow-shafted flicker seeks a natural cavity in an old stump or tree, but it may settle for a large birdhouse. During courting season, these woodpeckers like to announce their availability by hammering on a downspout, metal roof or house siding.*

In most species of birds, the female is the nest builder, though the male may help gather nesting materials. Generally, the building of the nest takes a little less than a week. The most common type is the open cup, which the female designs with her beak and molds into shape with her feet and breast. Each species builds a distinctive type of nest, varying from the intricately woven, hanging nurseries of the orioles and vireos to the flimsy stick platforms of the cuckoos and the mourning dove. They range in size from the tiny quarter-sized nest of the ruby-throated hummingbird to that of the bald eagle which sometimes weighs two tons.

As soon as the nest is ready, the female lays her first egg and one each day thereafter until the whole clutch is laid. She delays incubation until all the eggs are in the nest, thus assuring that all will hatch at the same time. If the male is plain and inconspicuous like the female, he may take his turn at incubation of the eggs; if he is bright-colored, as males of many species are, he will not sit on the eggs at all. Because predators could more easily spot him, the nest would be in danger.

Each female during the nesting season has a bare patch among her breast feathers, called the brood patch, to warm the clutch next to her skin; males that help with the incubation have it also. Most species that have open nests, lay speckled, blotched or colored eggs which are more protectively camouflaged. Those like woodpeckers and the chimney swift that nest in dark cavities, where such coloration would be no benefit, often lay pure white eggs. The eggs of most small birds hatch in a little less than two weeks. Some lay only one clutch a year, others two and sometimes three.

Most young birds hatched in nests above the ground are born naked, blind and almost helpless, requiring an enormous amount of feeding. Both parents are tireless feeding machines, working from dawn until dusk, each sharing equally in the task. In the days they remain in the nest, the nestlings grow at a tremendous rate, the feathers develop quickly and soon they have flown leaving the nest empty.

The young of many ground-nesting birds—ducks, quail, grouse, whippoorwills, and others—are bright-eyed and able to follow their parents and hunt for bits of food almost as soon as they hatch. Within two or three days they flee the nest, but may remain together as a family for most of the summer.

During the height of the nesting season, there are so many bird homes being built and maintained that it is impossible to keep track of them all. In backyard trees, in thickets, along fencerows, and in every woodland, we find birds nesting and caring for young, the parent birds often performing astonishing acts of unselfish devotion to their families, sometimes a devotion unto death.

Though dozens of species of warblers fly to nesting grounds in the far north, others go no farther than our western North Carolina mountains. Here we have the yellow-breasted chat which, unlike other warblers, supplements its diet of insects with cherries and

A mockingbird feeds *its young in a nest built in a Fraser fir, a sure sign that this neighborhood will fill with song in future years. Mockingbirds have been known to imitate the songs of 30 other species while defending their territory during courtship.*

other fruits. We also find the Louisiana water thrush that, despite its name, is really a warbler that usually builds its nest beside a rushing mountain stream. The ovenbird, another ground-nesting warbler, builds a roofed-over nest of leaves and grass, somewhat like an old-time oven. Other warblers that nest in our mountains include the black-throated blue warbler, chestnut-sided warbler, hooded warbler, and golden-winged warbler which normally builds its nest in a grass clump or among ferns and other vegetation.

Some time ago, I found the nest of a chestnut-sided warbler in a small maple. Not long after the female began laying her eggs, a parasitic cowbird laid a brown-speckled egg of her own in the nest. The warbler immediately began sealing off all of the eggs by building a new nest on top of the first one. When the warbler had laid three eggs on the second floor of the new two-story nest, the cowbird — not to be denied — managed to get another egg into it. The long-suffering warbler, instead of further trying to rid the nest of the unwanted egg, now began to incubate all of them. In the following days, after they had hatched, I watched the family while the young cowbird — a ravenously greedy foster child — grew to a larger size than even the adult warblers. No grave harm, however, came to any of the brood; all successfully left the nest.

When chimney swifts return from their winter homes in eastern Peru, they select a most unusual place to build their nests — inside our chimneys. Taking insects on the wing, they soar to almost unbelievable heights above the earth, climbing and diving, wheeling and swooping. Aviators have found them at an altitude of 6,000 feet. Since insects are more abundant at lower elevations, we wonder why they fly so high. Perhaps it is for the sheer joy of flying!

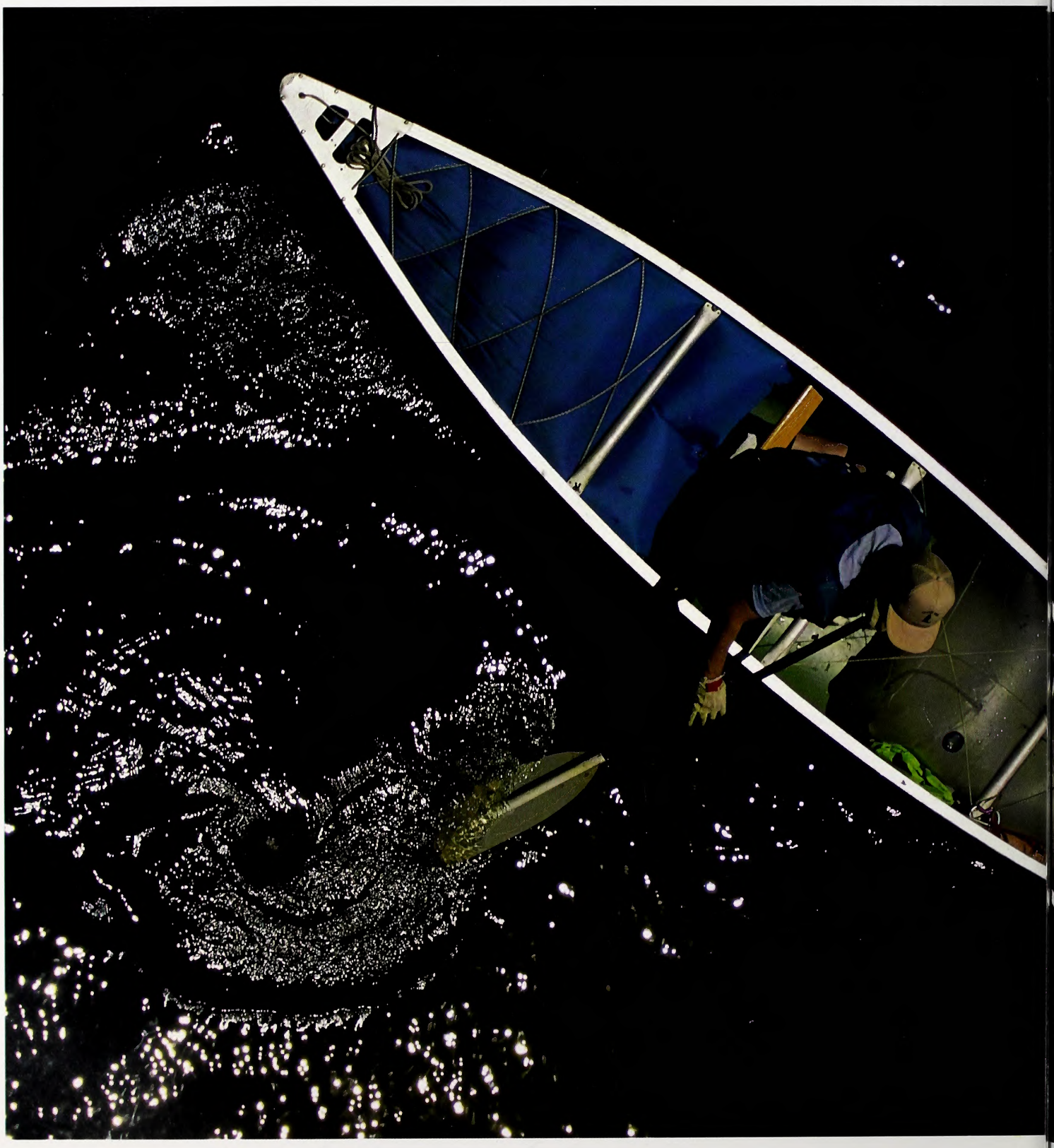
Fortunately for us, a few hardy winter residents, like the blue jays, crows, cardinals, juncos and chickadees, remain here to cheer us through the dark winter months, and on nights when flying snow fills the air, many of them find shelter in my backyard evergreens.

In the shimmering heat of late summer, with nesting over, the birds, one by one, fall silent and slip secretly away into the darker woods. But when the arc of the sun swings southward and the nights grow cooler, those birds that migrate are stirred by an inner restlessness. As the fall season approaches, they begin gathering in flocks. Soon they are on their way southward, leaving mild weather and fields filled with insects. In autumn, the birds travel more leisurely than do the spring voyagers, with none of the urgency and feverish clamor to reach nesting grounds on schedule. But guided by an unfathomable instinct, the autumn travelers pass from tundra and spruce to palm and pine.

On almost any clear, star-filled night in early autumn, one can hear hundreds of bird voices — small chirpings and twitterings and wisps of sound drifting down from the migrants — cries that are almost lost in the vastness of the night sky. They have left us for lands that know no winter, leaving our woods silent and empty. But as surely as the green of spring, they will come back again to gladden us with their bright colors and their songs.

Knowing this, we turn our eyes upward as the autumn flocks pass, sensing the magnificence of nature's ancient and eternal rhythms. ⊠

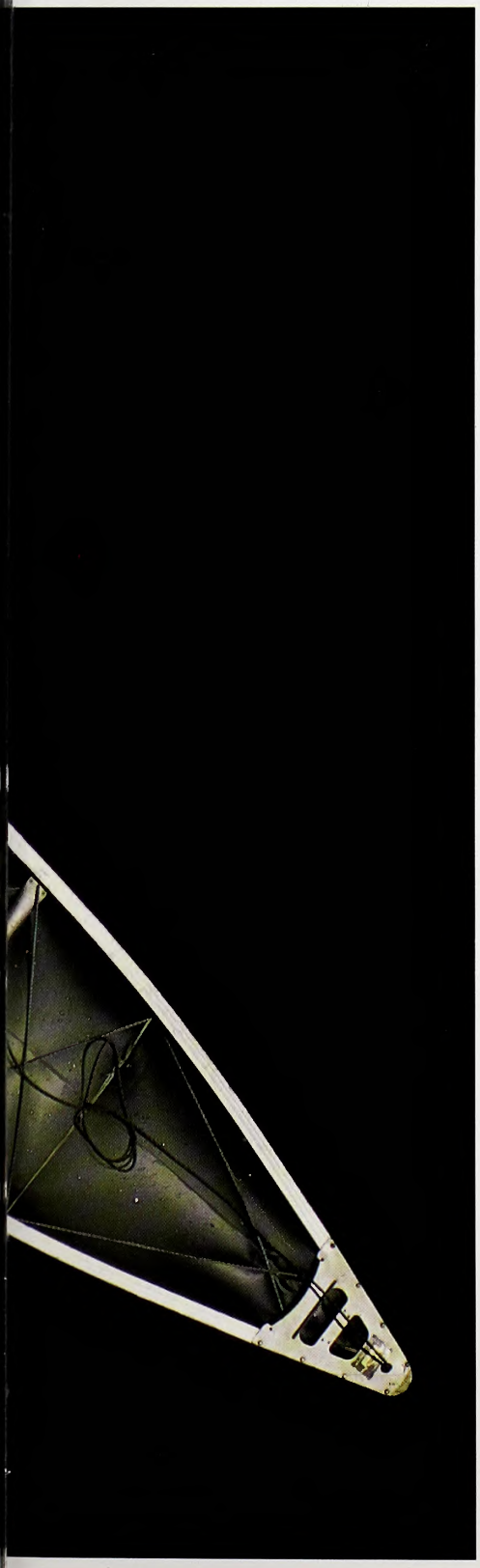
FESTIVAL ON THE



HAW

An annual celebration on the Haw River is proving there's hope for this troubled waterway.

by Marjorie Hudson



KEN TAYLOR

***During last year's** Haw River Festival, canoers carried a jug of pure water from the river's source in Forsyth County to its junction with the Deep River, 100 miles away. The three-week event was accompanied by educational programs along the river highlighting the need for the Haw's protection.*

It's seven o'clock in the morning, and, still groggy from a late-night training session, 20-odd sleepy campers swig coffee and herbal tea on the porch of the Ponderosa Club. Then we're off to the source of the Haw River, an hour's drive away. This is the first official day of the first annual Haw River Festival, the most ambitious project of its kind ever to take place in North Carolina.

For the next three weeks, April 28 to May 19, 1990, dozens of volunteers from all over the state will gather on the Haw River's banks for a "learning celebration" sponsored by a local conservation group, the Haw River Assembly (HRA). The festival crew will camp at seven riverside sites in five counties along the river, where a total of 2,500 fourth graders are scheduled to attend the six educational programs about everything from wildlife to recycling.

Each day, some of the crew will take a break to canoe a stretch of the 100-mile river, carrying a jug of clean water from the source to its confluence with the Deep River where it becomes the Cape Fear. Together, the Haw and the Cape Fear rivers make up one of the biggest watersheds in the state.

I have pledged to volunteer a few days for the festival, and find myself pulled into its current, wanting to be part of each week's crew, wanting to get to know the people and the river both up and downstream from where I live in Chatham County.

We begin, as is appropriate, at the source.

April 28, 1990: Forsyth County

The Haw River rises near Kernersville, at a spot in the woods behind the Bible Revival Ministry Center parking lot on Route 150. Two seeps out of the earth form two tiny creeks that join not far away. We are at the river's highest elevation on the topographical maps, and by geology's definitions, this is the source.

We trudge through the woods down to a green glade where the light seems to come out of the ground itself. The group slows as it approaches a hollow flocked with ferns surrounding a sand-bottomed pool clear as air. Here, a small table has been set up on which sit a jug and a cup. The jug was crafted of local clay by Mark Hewitt, in a style reminiscent of colonial times, with a drizzle of blue down the brown salt glaze.

We gather in a ragged circle around the pool, and after a long silence, we each go forward, as the spirit moves us, and scoop water from the pool with the cup, say a few words, then trickle the water into the jug. I watch the faces, some familiar, some new, all concentrating on the moment. We've been a long time getting to this point.

Why would 300-odd people give up to a week of their lives to help save a river some of them have never even seen? I'm amazed at the enthusiasm of the volunteers. Musicians,

artists, teachers, nurses, doctors, kayakers, housewives, carpenters, secretaries, shop clerks, students, park rangers, storytellers; people from Maryland, New York, Durham, Greensboro, Raleigh; the oldest volunteer I will see during the fest is over eighty, the youngest crew member is twelve. Some are champion kayakers, some have never been in a canoe. There is something about a river festival that brings people out of the woodwork.

Louise Kessel is part of the reason. As festival organizer, Kessel has drawn on her experience as a professional storyteller and environmentalist to find just the right combination of people, skills and events to create a festival tailor-made for the Haw River. Thirty years old, with wide, high cheekbones, a swatch of freckles across her face and long black braids to her waist, Kessel is a native of Chapel Hill who settled in Bynum, an old mill town on the Haw. In winter she can see the river from her back porch, and she can hear it year round.

Kessel credits her knowledge of the inner workings of river festivals to her three-year stint with the sloop *Clearwater* on the Hudson River in New York. The *Clearwater*, crewed by musicians, storytellers and environmental educators, travels up and down the Hudson giving shows for school children, mixing an environmental message with fun.

She decided to use what she had learned and apply it in her own backyard. She wrote a proposal, worked out a budget and a fund-raising plan, and took it to the board of the Haw River Assembly, a local nonprofit group dedicated to the restoration and appreciation of the river.

The Haw River Assembly was founded in 1983 over concern about the impoundment of the river by B. Everett Jordan Dam south of Pittsboro. Typical of Piedmont rivers in some respects, flowing through rural landscapes and small towns, the Haw was notorious in the 1970s for its pollution load, from sources such as industrial mills, city sewage, landfill leachate, sediment and agricultural runoff. At low-flow, experts said, up to 90 percent of the river's flow consisted of treated sewage — not an appealing thought to those who drink, canoe or fish its waters.

During the Assembly's lifetime, its mission has evolved to encompass protection of the water quality and wildlife both upriver and at Jordan Lake. A small but loyal constituency has emerged to promote clean-up programs, wildlife protection, stricter landfill regulations and even Scenic River designation for the beleaguered Haw. Sponsoring a festival of this size, however, was a whole new ballgame.

How did Kessel know it would work? "I didn't!" she laughs. "It could have bombed!"

Over the winter things began to fall into

MELISSA McGAW

***Musician Mike Hamer** (left) and storyteller and festival organizer Louise Kessel (right) entertain fourth graders at a river landing. The festival's games, programs and optimistic message drew an overflow of 2,500 school children.*

place, almost miraculously. The money came in. The volunteers signed up. More schools wanted to come than could be fit into the three-week schedule. After a year of being bombarded with particularly bad news about the environment, people seemed to need to be part of a project whose spirit was optimism.

The first week, it turned out, was a wet one. First, it rained. The field on which stations were to be set up became flooded. Buses showed up at the wrong times. It rained some more. Tents were swamped by mud. It hailed. But it all rolled off the crew like water off a duck.

Week one's crew had the toughest route and the wildest weather, including repeated thunderstorms and golfball-sized hail. But, they also saw redwing blackbirds, redtail hawks, beavers, and beaver ponds filled with waterlilies in bloom. "When people came back from the first day of canoeing," Kessel reports, "they were just lit up—'riverstruck,' as we called it."

May 4: Alamance County

Betty Woody—described to me as "the most laid-back person you've ever seen in your life"—welcomes the crew as we arrive at her house, crowding the driveway, backyard and pastures with our tents and equipment.

The river here in Alamance is a pastoral stream, shallow and burbling, running past an old mill and under Hobbs Mill Road. It's wider than at the Ponderosa and you can see where it's carved out a floodplain in the low part of the pasture. The pasture stretches down to the water and up to a small bluff, salted with lusciously prickly thistle flowers tinged magenta.

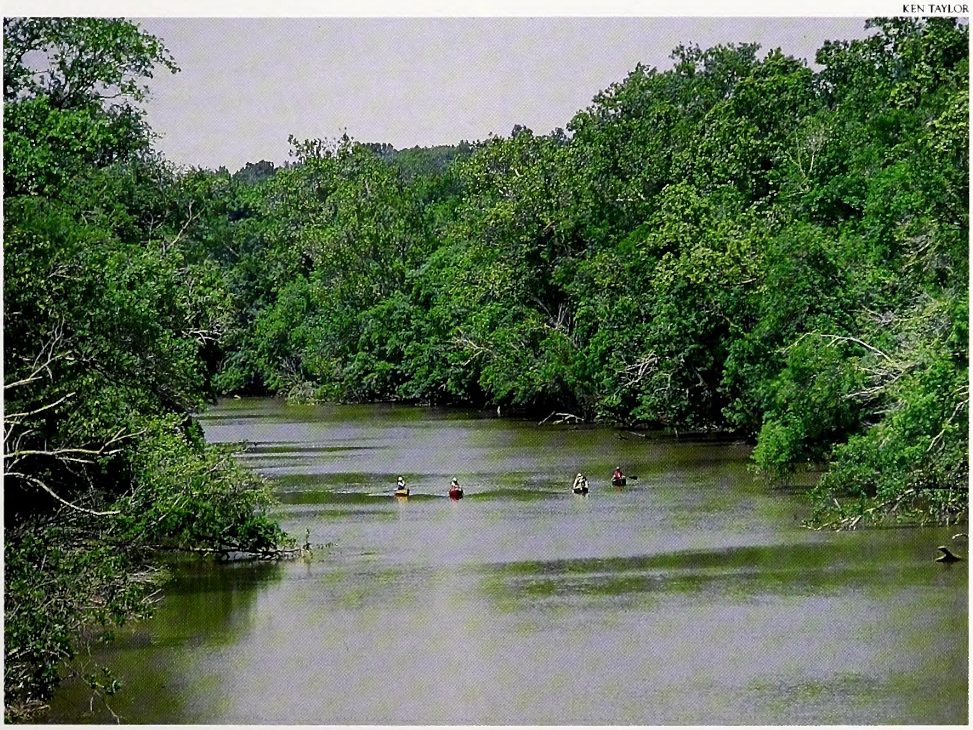
Clouds shift across the sun and we get a sudden dousing, everybody crowding into the small shelter. The sun edges out while it's still raining, and Jay Mankita says, "I bet there's a rainbow." We peer out and, yes, there it is. Not just one, but a double arch. The light seems to crystallize over this backyard; we all smile at each other. It's a good omen.

May 10: Swepsonville

It's been raining all morning and most of the night and I'm on canoe crew. The river here is a much different animal from the upper Haw. At the put-in, it's a full-fledged roaring flood; the last half will be a wide lake, backed up by the Saxapahaw mill dam. My partner and I slip down the mud bank and find our places, immediately pulling into the eddy behind the bridge piling to wait for the others. As we hold our position, cans, bottles, plastic bags, cups, paper, cardboard boxes, logs and

***Each day,** festival volunteers canoed another stretch of the Haw, one of the state's most seriously polluted rivers during the 1970s. The Haw River Assembly, which sponsored the festival, has fought to protect the river since the group's formation in 1983.*

KEN TAYLOR



MELISSA McGAW

***Rapt children** find out about turtles from a wildlife instructor at one of the riverside programs. Kids also could take part in nature hikes and learn about local history, Native American lore, recyling and other topics.*

mysterious floating lumps shoot by us with amazing speed. It's as if a garbage truck had dumped directly into the river.

Our trip leader, a capable-looking young man with blue polypropylene suit and yellow kayak, warns us about "strainers," floating logs that can suddenly block the flow and "strain" the canoeist right into the water, and about the dangerous hydraulics around dams — there will be several on this route. We practice our strokes as if our lives depended on them.

It turns out we go *over* one dam that's been flooded out, then portage the next, stopping to look back up at the falls from below. This one's a lot bigger — maybe 10 feet tall — and the power of the water flowing over it flings mist high into the air. Lunch is pasta salad, one bowl and one fork. We share it, plus apples and granola, then head back out on our way.

The thunderstorms that have been predicted today never come, and by the time we hit the wide riffling lakewaters of Saxapahaw dam, I've long since taken off my wool sweater and rolled up my sleeves to get a sunburn on my arms to match the one on the tops of my thighs. A cool breeze keeps shifting us river left, but we shuffle our way in a swaggering line across the surface toward the takeout, watching a great blue heron sail over the flat horizon line of Saxapahaw dam.

May 11: Saxapahaw

I'm on logistics crew today at Saxapahaw Community Center, an indoor basketball court with a gleaming hardwood floor, bathrooms to one side, and kitchen and dining area. A low grassy field behind holds our tents with enough flat space left for games and educational stations, and it gives the best view of the Haw River in downtown Saxapahaw.

At seven-thirty, local volunteers arrive with a gourmet breakfast, omelets and coffeecake hot out of their home ovens. At ten of nine we can't decide whether it's going to rain or not. In the spirit of optimism that has ruled this event, Louise says, "I think it's going to be sunny. Let's do it."

It's nine o'clock. We're ready. The sun is shining, and finally, the first school bus arrives. Kids are fingering real pottery sherds and arrowheads from an archeological site on the Haw. They're learning about African-Americans working as blacksmiths here in the old days. They're watching, pie-eyed, as someone handles a banded watersnake with ease, loop over loop. They're telling *us* things we didn't know before about Indians and old cotton mills. They're singing songs. They're playing "Cloud, Rain, Pond," a game about the water cycle.

Al Mora is leading a short nature walk, picking plants from the field at random and talking about them. An actor and a self-described "wild foods nut," he poses the question, "What is a weed?" then answers it himself: "A weed is a vegetable whose good qualities have not yet been discovered!"

In fifteen short minutes he shows us an ash tree (makes good baseball bats), sweetberry leaves (the spots are larval wasps), sweet gum trees (beavers like to eat the gumballs — they're sweet!), box elder (looks like poison ivy when small, you can make maple syrup out of its sap), violets (good to eat, have three times the vitamin C of oranges). Broadleaf plantain, he says, was called "white man's track" by Indians, because the seeds would get caught up in the pants the settlers wore, then would fall off and grow where they walked.

Mora asks for a volunteer and tosses a spray of goosegrass, whose seeds make it stick to the kid's shirt. "Vegetable velcro!" he crows.

It's almost time to switch groups, so I sprint around to the different stations and give the five-minute warning. At the wildlife station, the crews are making a special effort, with each group of kids, to talk about the useful qualities of snakes. "Usually when you ask a kid what to do if they see a snake," says Eloise, "they say, 'Kill it!' " Volunteers explain how to keep from disturbing snakes when you're walking and how they play an important role in the ecosystem. I grab the chance to hold one of the snakes, something I've never done before. The skin is as cool and delicate as Moroccan leather.

At the recycling station they're playing "Landfill" now, a game in which each kid is a kind of trash crowded into a landfill so tight they can barely move. Industrial chemicals, table scraps, old tires, cans, bottles, Styrofoam cups, old tractor parts, bags of leaves. One by one, the kids get "recycled" and get to leave the landfill until all that's left is certain kinds of toxics and nuclear wastes. They'll remember this stuff, I think, looking out across the children's faces in the clearing. If not, we'll be back next year.

May 12: Orange and Chatham County

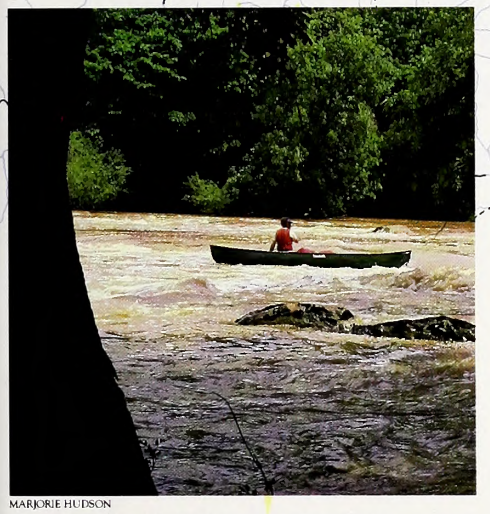
We put in on Cane Creek, a stream of dappled light passing under huge trees and over just enough rocks to make a pleasant rippling sound. We can just see the Haw through the trees, bright light on brown water. As we shoot out of the shadows, the river takes over and bears us along like royalty.

Today's trip will take us through some of the Haw's best whitewater. The water level is good — enough to carry us easily over the rocks that can be keel-scrapers but not enough to wash out the best rapids.

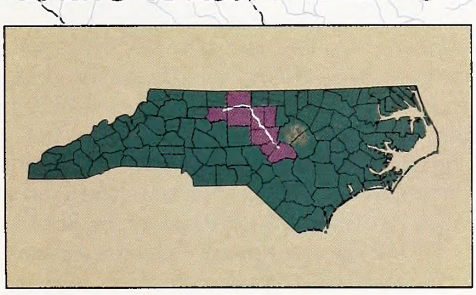
One lanky fellow whose life preserver reads "SLIM" is powering along in a full-size canoe with a flotation seat in the center. Every riffle, he peels out and surfs. A kayaker joins him. They ram each other playfully, vying for position.

My partner and I take up the sweep position. Joe Jacob runs a local canoe livery service and lives right on the river at Rock Rest, our destination. During the week, he's Director of Science for the Nature Conservancy Southeast Region. We practice our eddy turns until they're elegant. I see whitewater

The Haw River



MARJORIE HUDSON



ahead and, with Joe's permission, I aim us straight for the biggest waves. *Whah-hoo!*

We continue down past banks of rhododendron in bloom, light pink froth hanging above us. Chris Carter, crew herpetologist, finds a snake or a turtle on every branch and rock. Others collect paper, cans and bottles that have fetched up on the rocks and snagged in the low branches in the recent flood. A friendly contest ensues between two canoes.

We stop to scout the biggest rapid of the day—Sawtooth Ledge, a Class 2—and I lean back in the canoe in the blazing sun while others explore the poison ivy-infested rocks of a small island. Lynn Carter comes back with an armful of jewelweed, nature's antidote for poison ivy. We all scrub our legs and arms with the juicy stems.

All negotiate Sawtooth rapids with style, making the wide turn and skimming just under a huge tree branch. It isn't until some lesser rapids farther on that one of the trash-laden canoes tips and dumps its contents, paddlers and all. All but the trash can be easily rescued, but bottles and cans bob downstream, slowly heading seaward.

The festival will continue for another week, going to Bynum and Jordan Lake, and eventually ending up at Avents Ferry. The idea is catching on, in hometowns up and down the Haw, that the river makes us neighbors. There's talk of some of the crew getting together to canoe down the Cape Fear to where it sweeps into the ocean. Meantime, we'll pour some of that clear-as-air spring-water out of the jug into this lumbering brown river—as pure an act of optimism as any I can think of. ☒

Marjorie Hudson, a member of the Haw River Assembly, is a river-lover and writer who has adopted Pittsboro as her hometown.

Hometown Rivers

To volunteer for this year's Haw River Festival (April 19 to May 18), contact:

Haw River Assembly
P.O. Box 187
Bynum, N.C. 27228
(919) 542-5599

Other groups are championing rivers throughout the state. Here is a list of existing groups and their telephone numbers.

Association for the Preservation of the Eno River Valley
(919) 383-6337

Cape Fear Assembly
(919) 483-5137

Citizens for a Cleaner Catawba River
(704) 728-8072

Committee for the New River
(919) 272-8965

Deep River Citizens' Coalition
(919) 431-2753/(919) 498-7513

Edgecombe-Tar River Foundation
(919) 823-2534

Elk River Coalition
(704) 656-2773

French Broad River Foundation
(704) 252-1097

Jocasse Watershed Coalition
(704) 885-8229

Lumber River Basin Committee
(919) 649-7581

Neuse River Foundation, Inc.
(919) 633-4915

Pamlico-Tar River Foundation
(919) 946-7211

Pigeon River Action Group
(704) 456-3293/(404) 352-9281

Rocky River Association
(919) 663-2819

Yadkin-Pee Dee River Basin Committee
(919) 722-9346

To start your own river group, contact:

Stream Watch Coordinator
Department of Environment, Health and Natural Resources
P.O. Box 27687
Raleigh, N.C. 27611
(919) 733-4064.

Cane Pole Chronicles

Borrowed time, a borrowed pole and lessons in simplicity.

by Eddie Nickens
illustrated by Jimmy Brown

The cane fishing poles hung from rusty nails sunk into the weathered siding of Mr. Harris' toolshed. Four poles, each fully 10 feet long, were bound together with twine, their lines carefully wrapped around the ends, hooks safely embedded in the bobbers. I thought of my spare bedroom, that rat's nest of a repository for my own outdoor gear, and winced. Order, I thought, looking at the neatly tied bundle, from a more ordered time. I tugged on a single strand of cotton rope and the knot loosened, spilling the poles into my hands.

Mr. Harris didn't remember when last he'd used these poles—before the aneurysm, before the pulmonary fibrosis, before the heart surgery. Now he didn't really need them, he said, except on rare occasions when Agnes would drive him to a farm pond and he could sit by the truck for an hour or two. It's hard enough to cast with 70 years at your back; it's harder still with a tank of oxygen tugging behind.

Agnes came to the door in her robe and stuck her head outside to tell me to check the hooks for rust and the lines for wear. I heard Mr. Harris call from inside the house as I walked down the driveway. "Enjoy 'em, boy!" he said, and I gripped the poles and grinned. "Enjoy these days!" I skirted the fence that runs through the side yard we share, eyes on the long shadows of the cane tips as they bounced and scratched the greening ground.

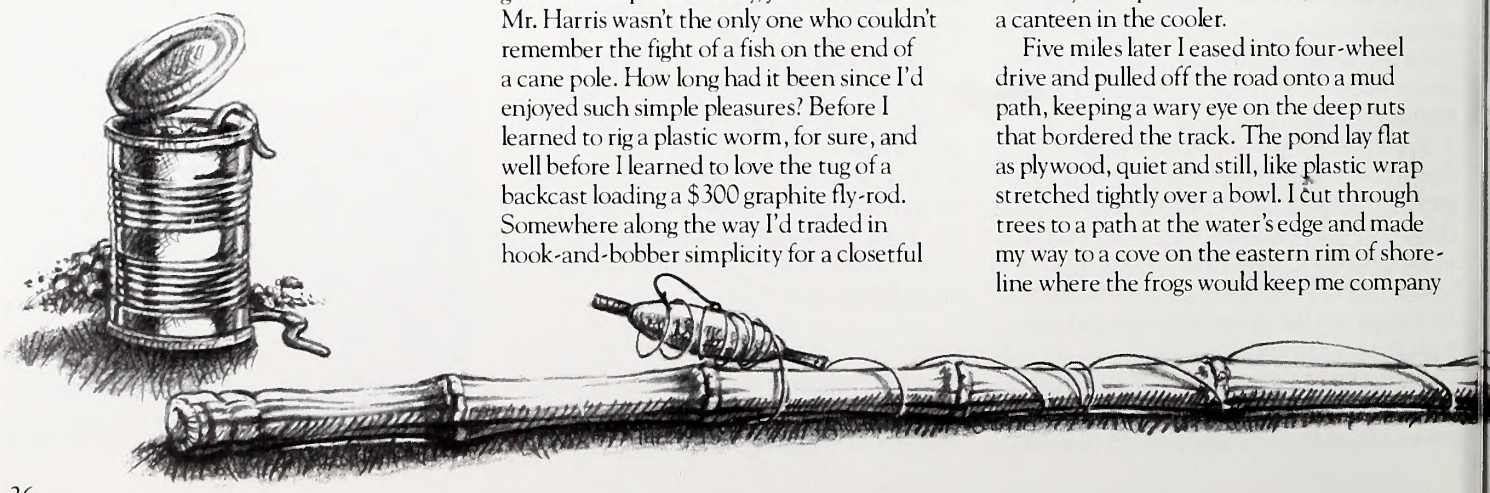
With only a 10-foot strip of grass and a grapevine separating our lives, I had been watching Mr. Harris die, as he was watching me live. On good days, when the air was clear and the humidity low, he and Agnes would set iron chairs in the front yard, sit and look out and talk for hours. They'd be there when I left on hunting and fishing trips, and there again when I returned. "What'd you get, Eddie-boy?" Mr. Harris would ask. "Lemme see 'em, Eddie-boy!" I'd haul a stringer of fish, or a pack of lies, to the chainlink fence and hold one or the other up to Mr. Harris' failing eyes. He'd cough and wheeze and squeeze out a few words. He was merely biding his time.

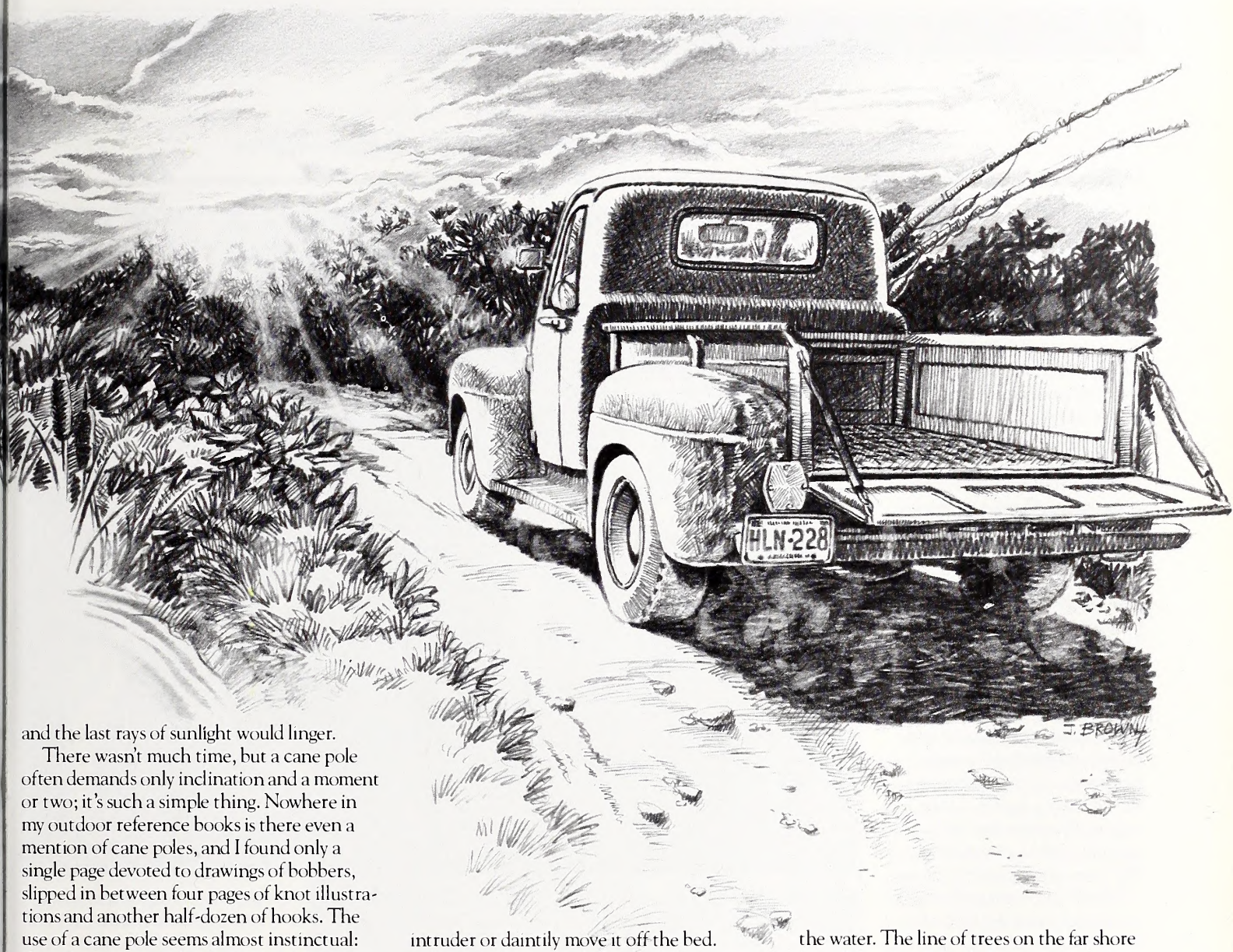
Long ago I'd seen the cane poles in the back of his truck and thought I'd have to give them a spin some day, just for kicks. Mr. Harris wasn't the only one who couldn't remember the fight of a fish on the end of a cane pole. How long had it been since I'd enjoyed such simple pleasures? Before I learned to rig a plastic worm, for sure, and well before I learned to love the tug of a backcast loading a $300 graphite fly-rod. Somewhere along the way I'd traded in hook-and-bobber simplicity for a closetful of synthetic fiber spun into rods, reels and realistic lures. I've often wondered if I hadn't struck a bad bargain, or at least put too much store in technology.

Last week I remembered those cane poles waving from the tailgate of Mr. Harris' truck. I was in the mood for simplicity; in the past two days I'd met with two insurance agents, a financial planner and an accountant. My mind ached for the basics: a cane pole, a bobber and flat ground under my back. I'd had an overdose of long-term thinking, of playing the odds of an economy 30 years hence, of pitting short-term assets against future needs. I needed to make a snap decision, based on the outside temperature and how long it would take to get to fishable water.

And I needed to get going—fast. I strapped the poles to the top of the car and slipped out of town, stopping only at a bait shop for a few extra corks and a half-dozen minnows. The man behind the counter fished out two net-fuls of flash and wiggle while I rummaged through the bobber bin. A box of long-shanked hooks rounded out the purchase. I already had split shot in the tackle box and a canteen in the cooler.

Five miles later I eased into four-wheel drive and pulled off the road onto a mud path, keeping a wary eye on the deep ruts that bordered the track. The pond lay flat as plywood, quiet and still, like plastic wrap stretched tightly over a bowl. I cut through trees to a path at the water's edge and made my way to a cove on the eastern rim of shoreline where the frogs would keep me company





and the last rays of sunlight would linger.

There wasn't much time, but a cane pole often demands only inclination and a moment or two; it's such a simple thing. Nowhere in my outdoor reference books is there even a mention of cane poles, and I found only a single page devoted to drawings of bobbers, slipped in between four pages of knot illustrations and another half-dozen of hooks. The use of a cane pole seems almost instinctual: thread a worm on a hook and hand the pole to nearly anyone, and chances are they'll know what to do—yank the whole enterprise out of the water when the bobber disappears below the surface.

Still, there is art in the use of this overgrown grass stalk. With a cane pole the expert can coax a bluegill onto a hook when all manner of spinning gear fails. The trick is in the bobber, the only link between the fisherman and whatever lurks below the water. Bluegills spawn in the shallows along the sheltered shore. With their short, blunt tails they make a depression in the mud, lay their eggs in the bed and then defend it against predation. When a dangling minnow drops into the nest, the fish will either attack the intruder or daintily move it off the bed. A few feet above, the bobber tells the story, be it nudge or frontal assault.

I fished a minnow out of the bucket and hooked it through the tail. I swung the cork like a wrecker ball, dropping the bait to the muddy bottom. The bobber sent tiny ripples into the pond, ripples that died away before they reached the stems of the lily pads that soon would crowd the summer water. I thought of Mr. Harris' shaking hands, hands that once held these poles over more farm ponds than I could count. The bobber hung there, silent and still, plugging a tiny hole between two worlds.

The sun's light was reddening now, coloring as it sliced more and more obliquely through the earth's atmosphere. A slight breeze rippled the water. The line of trees on the far shore lost all detail and the darkness deepened, until only the surface of the pond held light, a reflection broken by the lily stems, stubble on the flat of an old man's cheek. The bobber danced over a tiny wave, then settled.

I lifted the cane pole to check my bait and remembered Mr. Harris' words. "Enjoy these days," he'd called from inside his house, his waiting room to eternity. Not "Tear 'em up, Eddie-boy," or "Catch one for me, Eddie-boy," but "Enjoy these days."

Enjoy these days. It was a chorus sung by the bullfrogs, a refrain in the lapping of water at my feet. ☒

This story is reprinted courtesy of the author and Mid-Atlantic Country *magazine.*

Experimental Reintroduction Project Underway

Great Smoky Mountains National Park Gets Red Wolves

Written and Edited by Vic Venters

In the 1930s, the last wild wolf was sighted in North Carolina's mountains. Half a century later, they may once again roam the mountains of Tennessee and North Carolina. As part of an experimental reintroduction project, two pairs of mated red wolves were sent this winter to the Great Smoky Mountains National Park.

The red wolf pairs are being held in fenced acclimation pens near the Cades Cove area in the Tennessee side of the Park. It is hoped the mated pairs will breed and produce pups by April or May. One pair of adults and pups will be released in August, with the second pair held in reserve. Before release, the adult wolves will be radio collared and the pups will be implanted with internal radio transmitters so that researchers can track them.

North Carolina has the distinction of being the first location where the U.S. Fish and Wildlife Service has successfully re-established a viable red wolf population in the wild at the Alligator River National Wildlife Refuge. Currently, about 15 red wolves range free in the eastern North Carolina refuge. Of that number, at least four red wolves were born in the wild. There are another 12 held in reserve in captivity at the Alligator Refuge.

Fish and Wildlife officials say the Great Smoky Mountains National Park should provide suitable habitat for the red wolves, although the wolves may have to establish a large hunting range to gather necessary food. By releasing the wolves as a complete family unit, it is hoped the pups will keep the wolves from ranging too far or out of park boundaries. "We hope the presence of the pups will restrict the movement of the adults," Phillips said. "Plus the pups will have been born there and will consider the area as home."

KEN TAYLOR

Mountain Home: *This summer, a pair of adult red wolves and their pups will be released in the Great Smoky Mountains National Park as part of an experimental reintroduction project. It is hoped the red wolves will be able to establish a viable wild population.*

The red wolves should feed primarily on raccoons, rabbits and some deer. Its not yet known whether they will feed on the Park's wild boar population. Park officials would welcome the boar in the wolves' diet because wild boars are considered a pest as they root up and eat virtually anything edible, including many rare plant and animal species. "An adult boar would be pretty tough for the red wolf to kill," Phillips said. "They might eat their young, however."

Red wolves are smaller than the gray wolf and are extremely shy. Park visitors should have nothing to fear and should rarely encounter the nocturnal animals, officials said. "There has never been a documented case of a red wolf attack on humans," Phillips said. "They are very frightened of people."

Red wolves once ranged much of eastern North America until a predator-control program decimated populations and drove the animal to near-extinction. By the 1960s the only remaining population of red wolves had become compressed into a five-county area in Louisiana and Texas and was interbreeding with coyotes. To prevent extinction, the Fish and Wildlife Service removed them from the wild in the 1960s. Only 17 were determined to be pure-blood red wolves, but the Fish and Wildlife Service's captive breeding program has raised their number to about 130 worldwide.

Fish and Wildlife officials stress that the Park release is experimental and designed to reveal whether the wolves can survive in their new mountain home. If successful, Park officials would hope to have between 50 and 75 red wolves roaming in the park. "It's really too early to predict any numbers like that," Phillips cautioned, "and we're taking this experiment one step at a time."

Illegal Harvesting Blamed

Ginseng Populations Disappearing From Smokies

Despite a half century of protection, ginseng populations in the Great Smoky Mountains National Park continue to decline. Park researchers believe that extensive illegal poaching, combined with the plant's slow reproductive rate, are responsible.

The ginseng root is very popular in the Orient, where it is considered an aphrodisiac and is used for medicinal purposes. Unfortunately, demand seems to be outstripping the legal supply and illegal harvesting has placed pressure on its survival throughout its range. Once abundant in the Appalachian region and the Great Lakes region, the plant has decreased rangewide and disappeared from some locales.

When ginseng populations become low, reproductive success diminishes, say park researchers. "Extensive illegal collecting coupled with slow plant reproduction and growth has considerably reduced the plant's colonies in the Park," said Park Resource Biologist Keith Langdon.

Last fall, park rangers apprehended three poachers with over 1,000 ginseng plants taken from the park. Some of the roots were estimated to be over 30 years old. While ginseng was given federal protection in the 1970s, little has been done to halt the illegal harvest. The three ginseng poachers pled guilty and were given stiff fines and sentences. Until poaching is reduced, ginseng will continue to decline.

Especially Effective in Mountains

Wildlife Commission's Deer Decoys Fool Poachers

Although legal deer hunting season is long over, foam deer decoys continue to work overtime nabbing deer poachers.

Since last fall, officers with the N.C. Wildlife Resources Commission have been using the urethane foam decoys as part of their night deer hunting enforcement program. By last January, over 200 citations or arrests had been made for firelighting and other wildlife law violations in conjunction with deer decoy use. While the majority of deer firelighting and poaching coincides with the regular deer season, some poaching continues year round. The decoys will be used through the year as needed in poaching hotspots or areas of complaint.

Wildlife officers said that most of the cases had been made in areas where deer are not as plentiful, such as in North Carolina's mountain counties. "One of our decoys has 59 bullet holes in it," said Capt. Joseph Story, who supervises enforcement in Wildlife District 8 in the central mountain area. "It looks like Swiss cheese."

By the end of the winter, violators had not challenged the charges in court. In fact, say officers, many appeared so embarrassed to have been taken in by a decoy that they pay their fines instead of going to court. Officers say judges and prosecutors support the use of decoys. The largest fine in a decoy case came from federal court in which the judge ordered part of the fine be used to buy more decoys.

The N.C. Wildlife Federation donated 36 decoys last October for use by Wildlife Commission enforcement officers. Last year, the Wildlife Commission approved the use of decoys in wildlife enforcement work for the first time in North Carolina. "The use of decoys to combat the illegal practice of shooting deer frozen by spotlights at night was not a new idea," said Col. Harold Ragland, chief of the Division of Enforcement. "At the urging of sportsmen and prosecutors, North Carolina became the 39th state to use deer decoys, and the results have exceeded everyone's expectations."

Angela Dorman Hill

ANGELA DORMAN HILL

Decoy Donation: *Dr. Michael Corcoran of the N.C. Wildlife Federation presents Col. Harold Ragland, chief of the Wildlife Commission's enforcement division, with a urethane foam deer decoy. Enforcement officers have successfully used the decoys to combat firelighting and illegal poaching.*

Nongame Program Wins Award

The Wildlife Resources Commission's Nongame and Endangered Wildlife Program took home a North Carolina 1990 Take Pride in America award.

The Nongame program won an award in the state government category for its work in preserving rare sea turtles as well as protecting other endangered or threatened species. A committee selected 32 award winners in 12 categories last fall. The North Carolina award winners have also been submitted for consideration for a national Take Pride in America award to be chosen this spring.

Take Pride in America is a public lands stewardship campaign developed to increase the awareness of the importance of wise use of public lands and natural resources and to encourage individuals, organizations and communities in caring for these resources.

Topic Proves Controversial

Readers Praise, Pan Wetlands Forestry Articles

"Forestry Under Fire," our two-part series about intensive forestry in wetlands published in the November and December 1990 issues of Wildlife in North Carolina, *stirred more than usual interest. Here are a few reader responses, some of which have been edited for space. Other letters will be published in our May issue.*

Dear Editors:

In your November article, "Wetlands and Pine Plantations," your statement that "big timber companies in the East have been able to operate without much regard to their effects on wetlands" is patently biased and untrue. If your tour of our forest operations did not convey anything else, it should have conveyed our total commitment to the maintenance and stewardship of our forest land base. Our future and health as a responsible corporate citizen is dependent upon the continued health and productivity of our forest land. Weyerhaeuser operates with total regard for the impacts of its operations on the forest. This regard is based on science and the evolving debate regarding forest policy and practice.

The forested wetlands of eastern North Carolina are indeed a unique and valuable resource. The demands and needs of our society are complex. Meeting those needs and balancing the impacts of man on the landscape with the continued functions and health of the landscape is the greatest challenge of modern resource management. We *can* "have our cake and eat it too," or we can choose not to eat.

Charlie Williams
Environmental Forester
Weyerhaeuser

Dear Editors:

Thanks for your comprehensive article on wetlands forestry. I would like to tell Weyerhaeuser that "yes," I would be willing to pay more for paper products if that means preserving ecosystems. In fact, by considering the long-term effects this way, we would create incentives for the recycled paper industry, which is only proper.

Cynthia Strain
Highlands

Dear Editors:

Please pass my congratulations on an article well done to Associate Editor Lawrence Earley for "Can Wetland Forestry Survive?" It was a well-written piece of journalism, something rarely found nowadays.

Wildlife in North Carolina is one of the best state conservation magazines in the country. Your feature writing and layout and design are obviously products of hard work from you and your staff. Keep up the good work. Conservation is the child of education and your magazine is proving to be a good parent.

Gregg Patterson, Editor
Arkansas Game & Fish magazine

Dear Editors

The article in the November issue entitled "Wetlands and Pine Plantations" by Lawrence Earley contains a lot of confusing information. It has been estimated that 60 percent of the land east of I-95 would be classified as wetlands by the Corps of Engineers under 404 classification. The article addresses the conversion of pocosins into pine plantations. The significant thing is Mr. Earley did not understand that the 404 wetlands east of I-95 contain only a very small portion of pocosins. A magazine of your reputation should include the facts on how many acres of 404 wetlands are east of I-95 and what percentage of the wetlands are pocosins.

This article is not written with a balanced approach and seemed more interested in criticizing forest farming than trying to improve wildlife habitat. We certainly have a lot more deer in these pocosins than we used to have, and certainly it is because of continual clearing, harvesting and replanting pine trees on a 40-year rotation. Previously the pocosins had mature trees with a lot of thick underbrush which would not support deer.

This is a poorly written article which presents an unbalanced view of land management in Eastern North Carolina. It should be apparent that forest farming is no different than farming soybeans and corn.

Ross Lampe
Smithfield

Dear Editors:

Congratulations on your excellent series on the impacts of intensive forestry on wetlands. The articles present a balanced treatment of an exceedingly complicated and controversial issue.

As a researcher and environmental scientist, I have witnessed massive losses of natural wetlands to intensive forestry practices since the 1970s. Although it is true that in some cases pine plantations retain part of their natural wetland function, in many cases plantations are no longer even wetlands by federal definitions. In all cases, pine monocultures exhibit markedly reduced ecological functions when compared to natural forested wetlands.

It is unfortunate that the forestry industry continues to strike out emotionally on this issue instead of taking affirmative actions to solve the problem. The suggestion that conservation interests want to shut down forestry is pure hokum. We do, however, want to bring forestry — the largest continuing source of wetlands loss in the state — under regulatory review, and establish mechanisms to reduce its impacts on our natural heritage. President Bush and Governor Martin have both committed themselves to meeting the minimal goal of "no net loss" of wetlands. Attaining this goal will remain impossible without reducing and mitigating wetland losses due to intensive forestry.

Douglas N. Rader, Ph.D.
Environmental Defense Fund

Field Notes

Trout (Native Waters)	Year-round
Trout (General Waters)	Opens April 6
Wild Turkey (bearded birds only)	April 13 - May 11

Adoption First in State

Sportsmen Maintain Access Area

ANGELA DORMAN HILL

Adopt An Access Area: *Members of the Roanoke-Chowan Wildlife Club pose at the sign marking the first agreement between a club or individual adopting one of the state's boating access areas. The club adopted the newly constructed Shoup Landing Access Area in the Chowan River near Winton. Under the "adoption" program, individuals or conservation groups may choose one of the state's 157 boating access areas to help keep clean and to identify maintenance needs. For more information on adopting an access area, contact the Wildlife Commission's Division of Inland Fisheries at (919) 733-3633.*

Greetings from Middle East

Wildlife in Saudi Arabia?

Hello and greetings from the Middle East! I am assigned to the 363rd tactical fighter wing at Shaw A.F.B. in South Carolina and am part of Operation Desert Shield (Storm). I'm originally from Morganton.

It looks like I have missed hunting season this year but at least I've seen some of the fall and winter pictures taken by your very talented photographers. I must say that North Carolina is one of the most beautiful places on earth and you do a terrific job of putting it on paper.

Dennis L. Keller
363 Tactical Fighter Wing

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Calendar

On several occasions, events in this calendar have been changed or canceled without notice. Readers should check with the contact before traveling to an event.

April 13

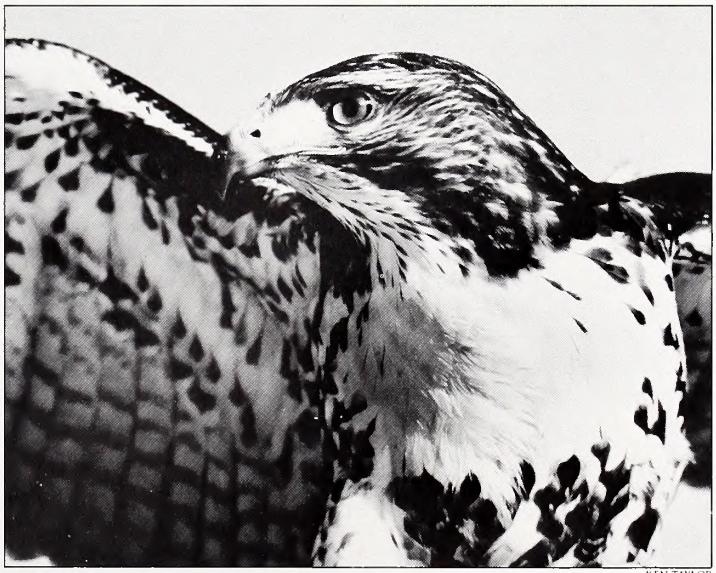
The North Carolina Bluebird Society will hold its sixth annual meeting at McKellar's Lake in Fayetteville. Dr. Lawrence Zeleny, the author of *The Bluebird*, will be the keynote speaker. For more information on the society, contact North Carolina Bluebird Society, P.O. Box 4191, Greensboro, North Carolina, 27404.

May 4-5

The 17th annual Traditional Wooden Boat Show will be held at the North Carolina Maritime Museum. For more information, contact the N.C. Maritime Museum, 315 Front St., Beaufort, NC 28516, or call (919) 728-7317.

Contribute This Month

Tax Checkoff Supports Nongame Program



KEN TAYLOR

Checkoff Time: *Each year, North Carolina residents may check a line on their state income tax refund and designate any or all of their refund to the Nongame and Endangered Wildlife Fund. Since 1983, your donations have helped raise $2.6 million to protect and manage species that are threatened, endangered or of special concern. Your support has meant that many endangered species have a chance for survival. Make your contribution directly or through the income tax checkoff to the Nongame & Endangered Wildlife Fund, N.C. Wildlife Resources Commission, 512 N. Salisbury St. Raleigh, N.C. 27604-1188.*

Bush Hogs, Grass Carp and Other Such Things

by Vic Venters

Like the temperature, the pace of habitat-improvement projects warms up in April. So break out your plows, tractors and fertilizer. You've no longer got the excuse of weekend football and basketball games to distract you. Or the weather.

Fallow Fields: If you have fields that are not currently in agricultural production, early April presents a good time to mow to prevent trees and other woody successional growth from overgrowing them. For optimum wildlife habitat, these fallow fields should be bush-hogged on a three-year rotation plan, mowing one third of the field each year. The third of the land you choose to mow should be bush-hogged in strips one to two tractor widths across. This creates lots of edge cover in which small game thrive. The strips can then also be disked to encourage the growth of native legumes whose seeds may be lying dormant in the soil.

Field Edges: April is a time when many farmers are out in the field preparing for the upcoming planting season. Consider leaving a 12- to 20-foot strip of uncultivated land along ditches or woods edges. In the early summer, this strip will provide a variety of weed seeds and insects for quail food. During fall and winter, the strip should provide excellent cover from predators for quail and rabbits. If you can leave the strip until next spring, it will provide nesting cover, a habitat often in short supply on today's clean-cut farms. Like the fallow fields, habitat strips should be managed on a three-year cycle to prevent successional overgrowth. Also, don't plant these strips in fescue, or spray with pesticides and herbicides.

Pond Fertilization: In some ponds, a more productive body of water that supports greater numbers of fish can be created by a systematic application of fertilizer. April is an excellent time for this when the water temperature tops 60 degrees Fahrenheit. Fertilizer stimulates the growth of microscopic plants that insects and aquatic organisms feed on, producing a larger food supply for fish. Generally, if your hand or other light-colored objects can be seen clearly 18 inches under water, fertilization can help your pond. However, excessive fertilizing can create noxious algal blooms, and fertilizer should not be applied to ponds with existing weed problems. For more information and technical assistance, contact the Division of Boating and Inland Fisheries at (919) 733-3633.

Weed Control: If weeds are a problem in your pond, the still-cool waters of April offer an excellent time to stock sterile triploid grass carp which are very effective in controlling hydrilla and other nuisance weeds in ponds and lakes for up to 10 years. In larger sizes, grass carp can eat more than their body weight in noxious weeds every day. It's best to stock grass carp that are at least 8 inches long to avoid predation. Only grass carp that have been genetically manipulated to make them triploid (sterile) should be stocked. If your pond is over 10 acres or you wish to stock more than 150 carp, a permit is required from the Wildlife Resources Commission. Call the Division of Boating and Inland Fisheries at (919) 733-3633 for a permit application or more information.

The snowy egret and other colony-nesting waterbirds need your help. Support the Nongame and Endangered Wildlife Fund.
(For more information, see page 31.)

Trillium Spring

Winter is surely gone when trillium begin to bloom on the drab floor of the forest. Not even a late dusting of snow can deny spring's advance.

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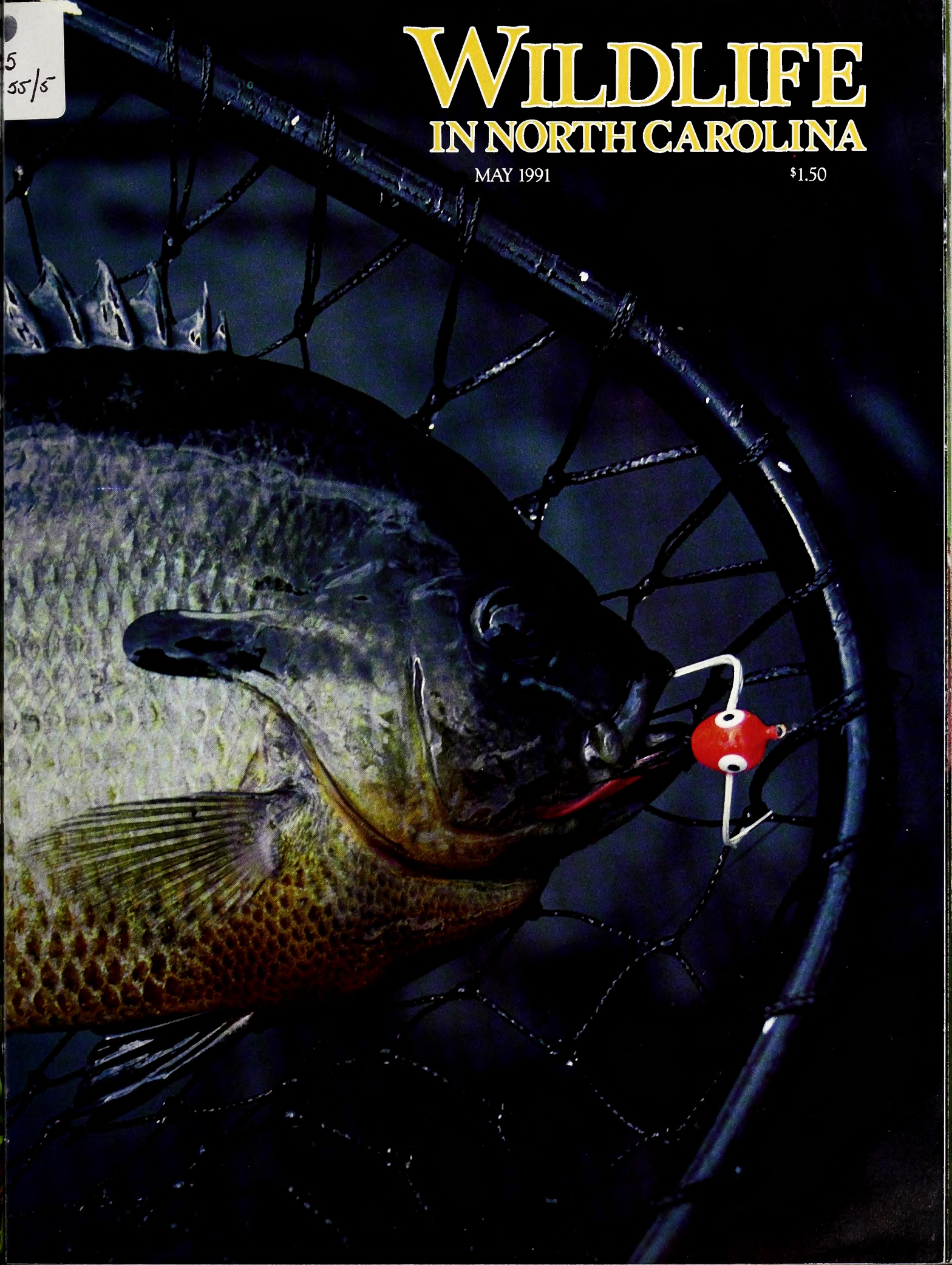
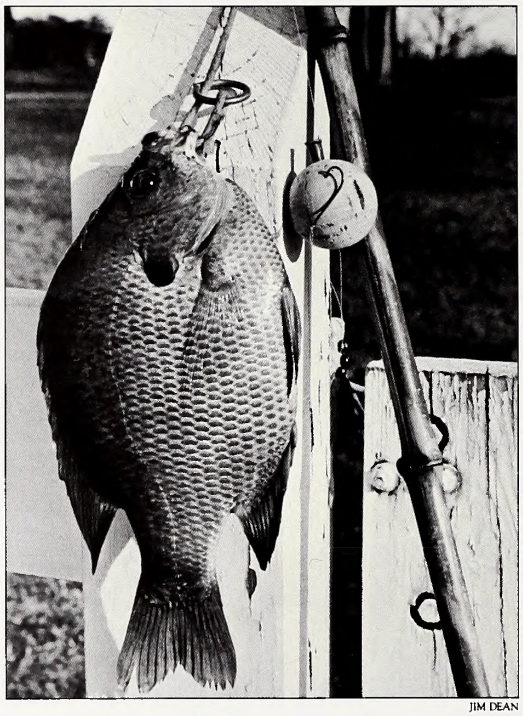


Children Of The Moon

by Jim Dean

"The child is father of the man," wrote William Wordsworth in the opening line of his ode, "Intimations of Immortality." Some would say that explains a lot of shortcomings, though perhaps not nearly enough. Indeed, had Mr. Wordsworth written his ode today, I suspect he might have run afoul of the Truth in Poetry Act of 1990 and been required to add, "except for those children who suffer severe cases of arrested development."

Some of us don't, you know. Grow up, that is. I myself have had some practical experience in the arena of extended childhood, and I've found it becomes most noticeable each May as the full moon appears in the balmy night sky. That bright and perfect orb mysteriously drives billions of fat bluegills and shellcrackers to their spawning beds with the urge to beget while the begetting is good. The prospect of all those begetting bluegills strips the years from ancient anglers and makes us crazy. It is, after all, no coincidence that the word "lunacy" is derived from lunar.



JIM DEAN

Like many moonstruck anglers, my long-time panfishing buddy and I indulge certain traditions during this once-a-year rite. It is, for example, essential that Jack and I make this particular passage in his 1956 Granny Smith apple green Ford truck. Even without the '57 Thunderbird V-8, three two-barrels, dual steel-packs and flames painted under the hood, this is the perfect chariot to carry a pair of senescent, perch-jerking partners back to the future.

We load the rear bed with a wooden pond boat, a 48-quart cooler, a couple of cricket cages and enough rods and cane poles to stock a K-Mart. We also carry a few light snacks just in case we get hungry, but no more than would fit into a second 48-quart cooler and three or four paper sacks. There is no truth to the rumor that Jack once carried a whole Smithfield ham and an angelfood cake. The first stop is always at the same tackle shop we've frequented for years, and the banter is always the same.

"Fill 'em up with insects," says Jack, setting the cages on the counter. "High test. We want maximum chirps per gallon."

We negotiate the last mile of a dirt path and launch the boat in the pond. The truck is filled with the sound of crickets singing boldly in the face of doom, and we join them — "Give us some crickets who are stout-hearted..."

Tradition calls for a light cane pole about 14- to 16-feet long, a sliding cork and a couple of small split shot pinched on the line above a No. 8 or 10 hook. If you don't have a truck, the proper way to carry cane poles is sticking out a rear window where they serve a "nose-thumbing" role for any passing motorist who isn't fortunate enough to be going fishing.

Once the boat is launched and loaded with our tackle and provisions, the biggest problem is finding room to sit. But we manage, and with decent weather and any luck at all, the fishing is always good. We seek the larger spawning areas, looking for countless circular depressions fanned out by the fish. They are often easy to spot along the banks or on shallow flats, and we can smell those too deep to see. As the action slows in one area, we move to another, baiting hooks with the same musty, unwashed hands that hold our sandwiches. The lemonade level falls; the cooler fills.

Late in the afternoon, slathered in suntan lotion and insect repellent, we drift contentedly under the warm sun, listening to the slap of water on the hull and the rasp of redwing blackbirds. Stretched out with hands behind our heads and feet dangling in the water, we watch puffy, cumulous clouds that invariably form the shapes of chickens. (Why is that, anyway? Is some obscure science at work here?)

For once, no one is thinking about deadlines and quotas. It is simple and timeless fishing that tends to blur memory so that you cannot be sure if it was four years ago that you caught a 26-ounce bluegill, or 26 years ago that you caught a 4-ounce bluegill.

I don't know what Jack thinks about, but I am often transported to identical days 40 years earlier when my father or grandfather and I drifted across old millponds under shaggy cypress. Once again I am 10 years old, lean and brown as a berry, and there's hair on my head. I have my wonderful bobber that whistles when a bream bites, and my hands smell like worms. The immortal redwings sing to me, and there is no intimation that this will ever end.

On the way back home, Jack and I tune in an oldies station and listen to the songs of our youth over the invigorating growl of the exhausts. Roy Hamilton, Johnny Ace and Bobby Blue Bland join the chirps of surviving crickets.

A new 300 ZX turbo pulls alongside at a stoplight, and the driver glances over and revs the engine, confidently issuing an age-old challenge. His last incredulous, open-mouthed look at this rumbling ghost from the '50s is of the rear end of a boat full of bluegills, poles and flapping corks nestled between two swiftly disappearing tail-lights.

"Don't mess with the forever young," Jack says. Shirley and Lee are singing "Let The Good Times Roll." We do.

May 1991
Volume 55, Number 5

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WILDLIFE IN NORTH CAROLINA

Wildlife in North Carolina is the official educational publication of the North Carolina Wildlife Resources Commission, and is dedicated to the sound conservation of the State's wildlife and other interrelated natural resources and the environment we share with them.

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Back of the Book *by Vic Venters*

Wildlife Through the Year *by Vic Venters*

Cover *Few freshwater fish are as handsome as the redbreast sunfish or robin. Photograph by Eugene Hester.*

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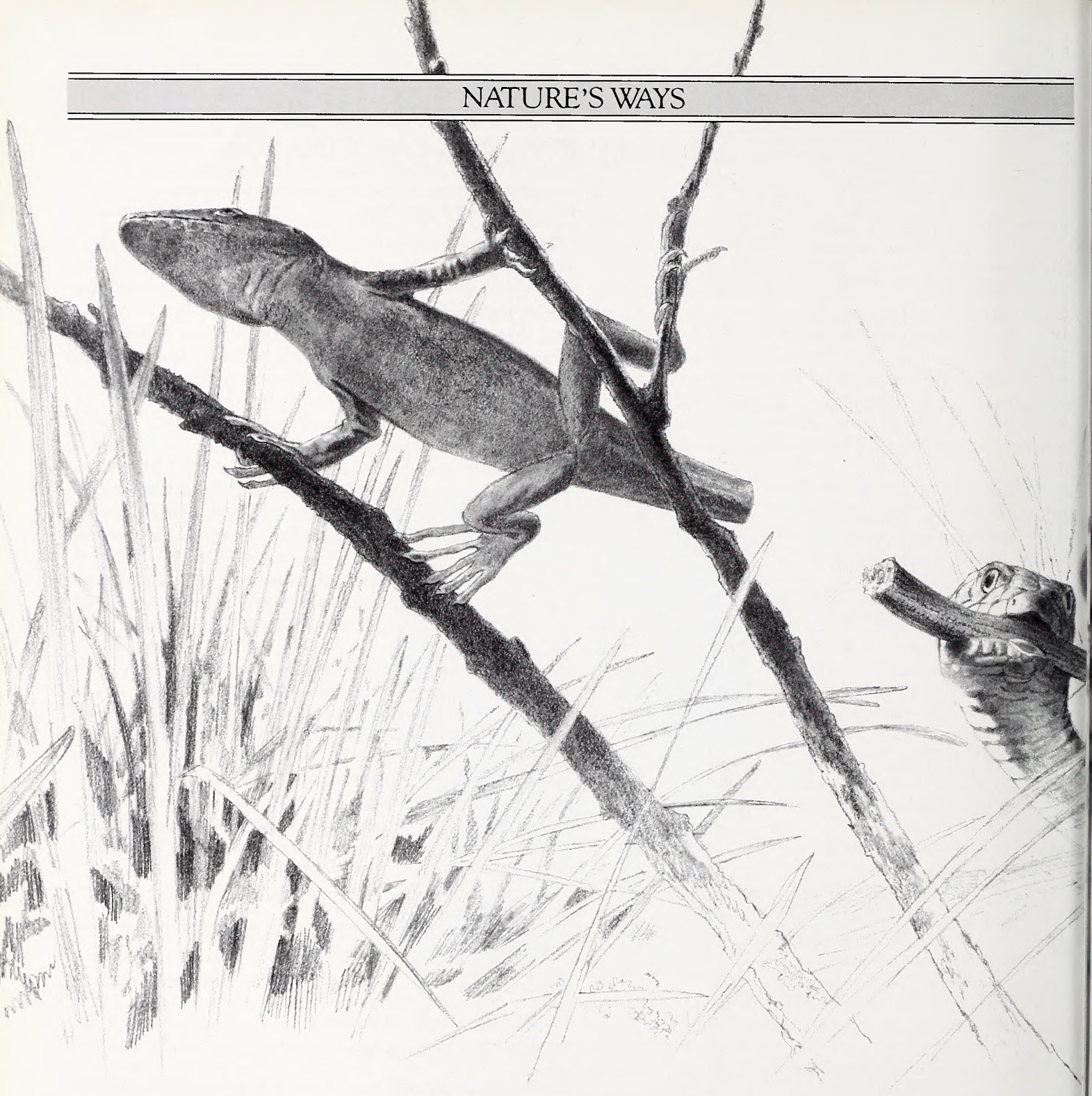
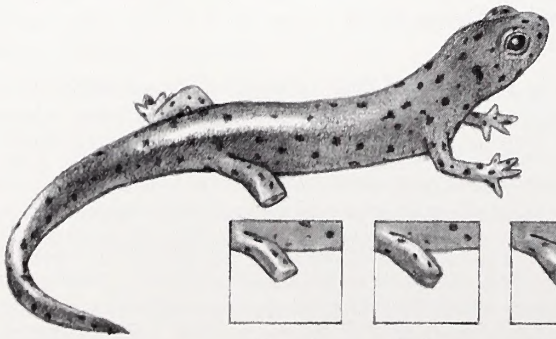




Day 1 | 7 days | 21 days | 28 days | 32 days | 42 days | 60 days | 70 days

Salamanders and frogs *(especially tadpoles) regenerate legs and tails easily. An amputated limb grows back in several stages over several months, beginning with a general rounding effect and continuing through the appearance of distinct toes until the leg is complete. The foot is smaller than the original foot, but it functions as well.*

Missing Parts Department

written by Lawrence S. Earley/illustrated by David Williams

Jesse Perry returned home from his vacation to find that his larval salamanders had turned cannibalistic. The Museum of Natural Sciences biologist found one of them so badly mauled that only its head and torso remained. Gone were its legs, tail and all six of its gills! Placed in a separate tank, however, the little fellow recovered and in several months it had grown new legs, new toes, new gills and a new tail.

Which is to say that the powers of regeneration among salamanders are phenomenal. But salamanders are only one of an impressive number of animals able to grow new body parts. Also sharing these powers, to some extent or other, are worms, arthropods (crabs, lobsters and crayfish), fish, reptiles and even birds and mammals. Every year birds replace their feathers during the molt and buck deer replace their antlers. Humans replace their baby teeth and continually replace finger and toe nails and layers of epidermal skin.

But salamanders, frogs and lizards are nonpareils when it comes to regenerating missing parts. Not only can salamanders replace toes, feet, legs and tails, they even have the capability to regenerate portions of their eyes. Frogs and tadpoles also regenerate toes, feet and legs. And many lizards can drop their tails and grow new ones.

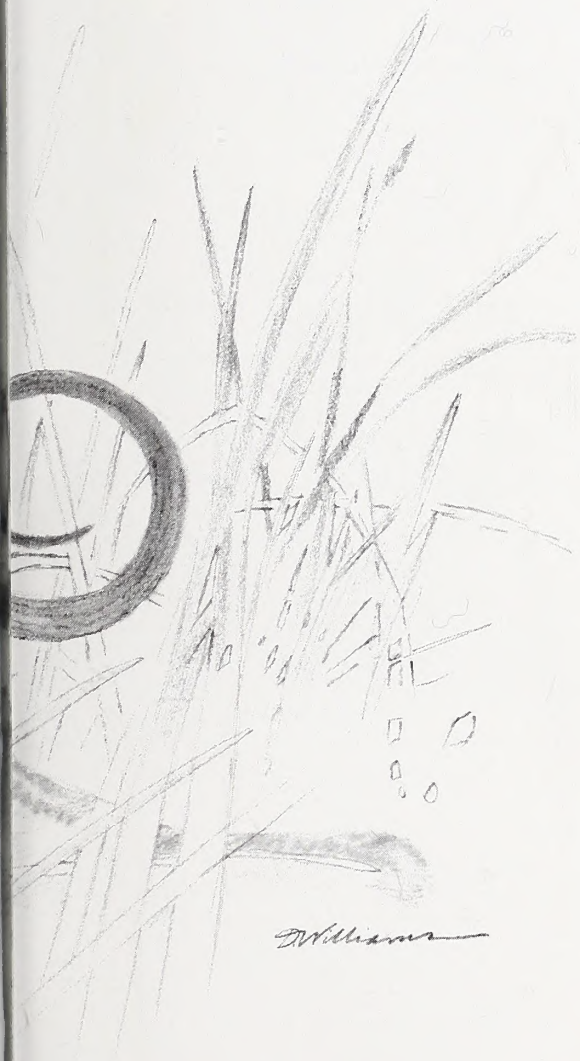
How they do it is a subject that has fascinated naturalists for thousands of years. Today we know that where a salamander leg has been chewed off, a bud, or *blastema*, forms consisting of new cells that multiply wildly. But what's fascinating, according to expert Richard Goss, is not just the new cells, which most animals grow to heal their wounds, but the mysterious way that these cells are organized into brand new tissues, and the tissues into brand new organs that actually work. It's a complicated thing, and we know little about it.

A lizard has an additional power called "autotomy" by which its tail drops off when grasped by a predator. The function of this power is purely defensive: while the predator is distracted by the twitching tail, the lizard makes its getaway. In time a new tail grows, although it may not be as well-developed as the original one. (Lobsters, crabs and crayfish also have the same capability, although only their legs can drop off.) A fracture plane, or a preformed weak spot on the tail, enables the break to occur at a predetermined spot. Some lizards have a fracture plane at the base of their tails, while others have break points at various spots along the tail.

Biologists are also mystified by the observation that regeneration only occurs within a certain territory on a salamander leg, for instance. If the leg is removed above a certain point, regenerative tissue will not form and the incapacitated amphibian most likely will fall victim to a predator.

It's easy to note the waning of regenerative powers among the higher life forms. A bird can molt its feathers, but it can't replace a leg. Does this mean that we're missing something? Richard Goss argues the opposite, that the mobility, intelligence and other adaptations of birds and mammals have enabled them to grow out of a dependence on regeneration. In other words, as handy as it is to replace a leg or an arm, it may be far better never to have gotten into that pickle.

"...regeneration is a good thing when an organism has failed to insure its own security from injury," Goss says. "But it is far better not be injured in the first place, thus making regeneration superfluous."



Close call! *The lizard lives another day because of its ability to drop its tail when in danger. This defense mechanism depends on a number of preformed weak spots all along the reptile's tail. When grabbed by a snake or other predator, the tail breaks off easily at that spot and heals quickly. Within months a substitute tail has regenerated, although it does not look like nor function as well as the original tail.*

JOHN MANUEL

DOWN THE TUCKASEGEE

From its headwaters in Panthertown Valley high in Jackson County, the Tuckasegee River flows northwest until it enters Fontana Lake. Once badly polluted, this handsome river is fast becoming the proud, rejuvenated centerpiece of the region.

by John Manuel

Name a major river in this state and chances are it will bring to mind a particular image: the Lumber — flat and dark, the Nantahala — clear and fast, the Yadkin — muddy and slow. To be sure, they all change in some respects from headwaters to confluence, but few show as many faces as the Tuckasegee River in Jackson County. Stand on its shoreline in half a dozen places and it will appear to be a different body of water — sandy-bottomed imitator of a coastal stream, powerful sculptor of magnificent rockforms, playful challenger of rafters and canoeists.

Unfortunately, the Tuckasegee that most people see is rather ordinary — a dark, swift river that pops out from behind a hill west of Dillsboro and parallels N.C. 19-23 to Bryson City. Even here, passing motorists must crane their necks to catch a glimpse of the river behind such roadside attractions as Uncle Bill's Cherokee Flea Market.

By the time the Tuckasegee (sometimes spelled Tuckaseigee or Tuckaseegee) reaches Bryson City, the show is over. The river has taken most of its tumbles, offered up its finest scenery. Like a tired old man, it slows and finally submits to the stilling hand of Fontana Lake.

The best of the river lies upstream, hidden among the folds of the massive peaks that climb the sky to the southeast.

"Look at this!" says Dan Pitillo as he inches to the edge of the sloping rock face. With a sweep of his arm, the Western Carolina University botany professor frames a flat, wooded valley nearly one mile wide. On the far side, smooth, gray walls of granite rise hundreds of feet from the valley floor. To the left and right there are others — giant granitic domes facing the western sky.

This is Panthertown Valley, a geographic anomaly that forms the headwaters of the east fork of the Tuckasegee River. On a topographic map, the valley stands out as a finger of pale green amidst a swirl of tightly knit purple contour lines. Pitillo says no one has come up with a definitive explanation for the presence of a high, flat valley in this otherwise mountainous terrain. So he offers his own.

"My guess is that there is a band of super-hard rock at the downstream end of the valley," he says. "That band of rock would act like a dam, backing up sediment behind it. Over millions of years, it could create a flat area like a silted up pond."

Whatever its origin, naturalists agree that the valley is deserving of special protection. In addition to its unique geology, the valley contains a host of endangered plant species and is one of the state's finest habitats for native brook trout. Three years ago, all of that led Pitillo and a host of conservation groups into an often hard-fought struggle with Duke Power Company for control of the valley and the construction of a power line through it.

Duke Power eventually built its line through the valley, but not before making significant concessions to conservationists. Once the line was completed, Duke sold all of Panthertown Valley to the Nature Conservancy, except the land needed for the right-of-way. The Conservancy promptly sold the 6,300 acres to the U.S. Forest Service, which currently maintains it.

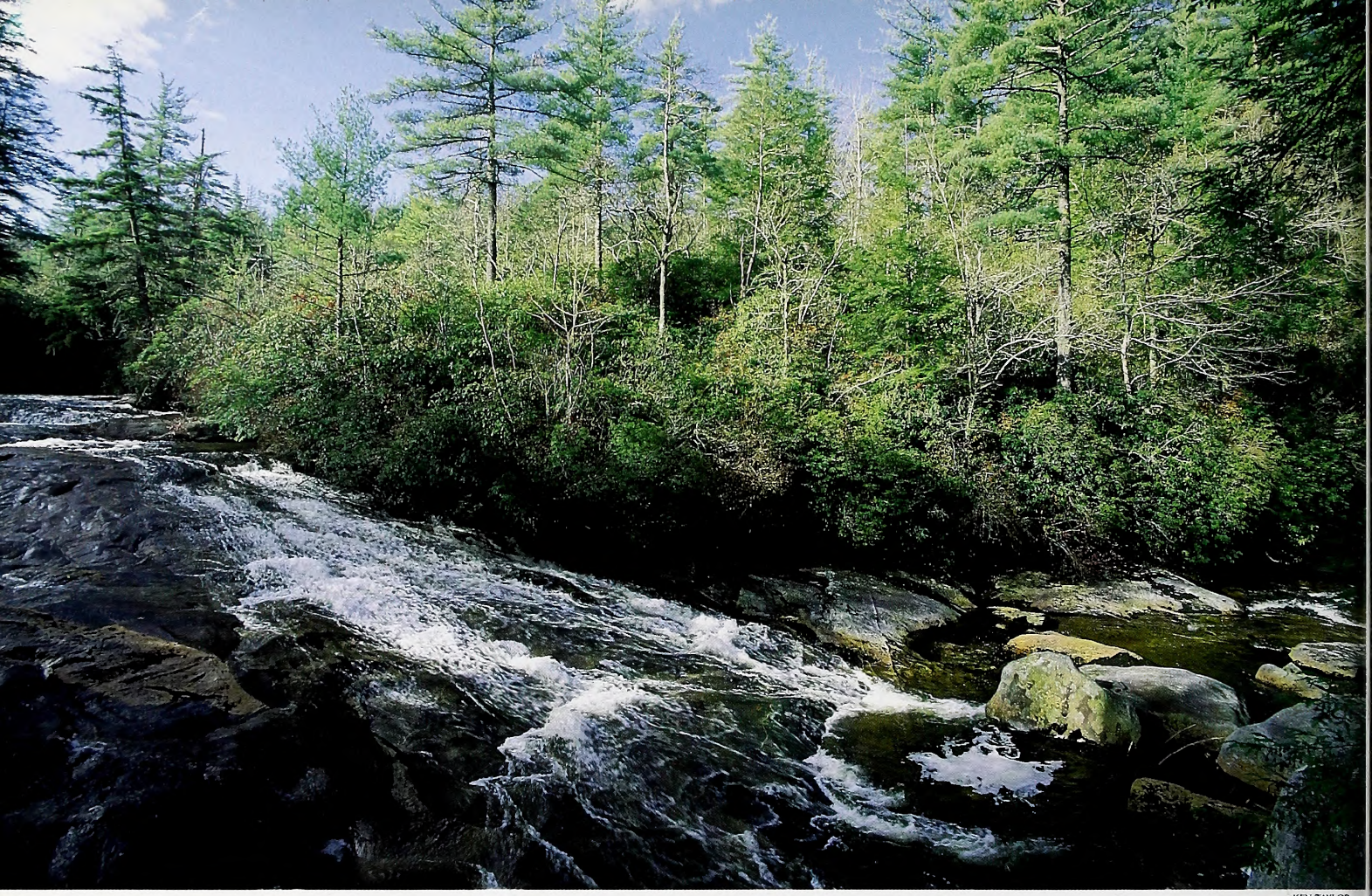
As Pitillo leads the way down the gravel Forest Service road into the valley, talk of the transmission lines gives way to that of the environment that has been preserved. We reach level ground and the crunch of boots on gravel gives way to the near-silence of sand. On either side of the trail 10-foot tall specimens of Jopay weed tower overhead. The terrain is flat, the walking easy.

"Doesn't look much like the mountains, does it?" says Pitillo with a wry smile. "You haven't seen anything yet."

Another 10 minutes, and Pitillo comes to a halt in a clearing. "See anything strange?"

To the right of the trail, a 10 foot-wide stream of tea-colored water slides across a bed of pure sand. Were it not for the white pines and rhododendrons on the bank, this would be a dead ringer for a coastal stream.

A mountain river *of many faces, the Tuckasegee begins in remote Panthertown Valley before plunging down through rugged Bonas Defeat Gorge (right). Surging for countless eons, the river's currents and swirling gravel have cut holes through the rocks in the steep gorge section of the river. In lower elevations (above left), the Tuckasegee is well suited for canoeing.*



KEN TAYLOR

The Tuckasegee *spills over a bed of granite in Panthertown. Even in the valley, the river is chameleon-like; one stretch is calm and quiet, another plunging and boisterous.*

DOWN THE TUCKASEGEE

"That water isn't discolored by a lumber mill like the Pigeon River's is," Pitillo explains. "It comes from humic acid in the soil."

Barely 6 inches deep, the stream veers away from the trail into the scrubby forest. When we see it again, it slides down a smooth vein of rock into a 30 foot-wide pool. A fisherman is standing waist-deep in the middle, casting a fly upstream.

"Any luck?" Pitillo calls.

"Not much," the man answers. "Got one about as big as my finger."

No sooner are the words out of his mouth than his rod bends toward a sudden swirl.

"You got one!" Pitillo says. "Looks like a good one, too."

After a brief struggle, the fisherman brings his prey to within arm's length. He reaches over and lifts the fish out of the water—a 10 inch native brook trout, magnificently colored in green and gold.

In keeping with the state's catch-and-release regulations for the Panthertown Valley, the fisherman takes a last look at his fish and puts it back into the stream. "That just made my day," he says.

Pitillo smiles and leads the way on down the trail. For the next hour, we walk through dappled sunlight along streamside trails, heading for the ridges we had seen at the northeastern edge of the valley. The forest canopy blocks out any view of the granitic domes, but we know we are close when the first of Duke's transmission towers appears in a clearing ahead, which runs along the base of Big Green Mountain. Positioned between trees of equal height, the towers and wires are visually unobtrusive even at close range.

We parallel the line for several hundred yards, then veer off toward the north. The trail heads downhill through the forest, crosses a small stream, then rises and turns northwest along the base of Boardcamp Ridge. Evidence of the scant use of the valley is that there are no trails leading up the magnificent domes. But that's an adventure best left for another day. We head downhill again, weave through a tangle of rhododendron, and emerge into bright sunlight.

"This is it," Pitillo says. "This is the east fork of the Tuckasegee. It's a lazy brownwater stream right up to this point, but from here on down, it's basically one big slide."

The contrast couldn't be more abrupt. To the left, the dark, still waters of the upper Tuckasegee disappear into the flat woodlands of Panthertown Valley. The gentle current visible upstream is here stilled by a vein of granite that runs like a dam from one side of the stream to the other. Across its 40-foot width, an inch or two of water runs over the top and begins the five-mile plunge toward Tanasee Reservoir.

We step out onto the dry edges of the rock and look downstream. The water is alive with roostertails and whirlpools where it runs over a carved edge of bedrock or stalls in a pothole. At the bottom of this natural spillway, the water crashes into a wall of boulders, angles hard to the left, then turns and disappears down the valley. "The only people who ever go down there are fishermen," says Pitillo, "and not many of them at that. It's pretty treacherous."

"Are you sure you know where you are?"

The quick laugh tagged onto the end of Alan's question is meant to reassure me. But it's the second time he has asked in the last few minutes, and I know he is worried.

"I'm relatively sure it's at the end of this gravel road," I say. "But it's been awhile."

Alan Parnell, Duke professor of sociology

and my sometime hiking companion, nods half-heartedly. I quicken the pace. It's been almost half an hour since we left our car at the end of a washed-out dirt road in a mountain hollow. We are searching for the entrance to Bonas Defeat Gorge — one of North Carolina's least known and most spectacular natural areas. The reason for its secrecy is threefold — it's in a remote corner of a rural county, it's difficult to find, and once you find it, it's treacherous to climb.

I had been here five years before with a Nature Conservancy tour, but I had failed to take note of every turn in the maze of Jeep trails leading down the mountain. There are no signs pointing the way, no clearings in the poplar forest to indicate where the narrow gorge might be. Rounding a bend in the trail, I hear the humming of an electric generator and know we are close. During the 1940s, Alcoa Aluminum built a series of hydroelectric dams and reservoirs on the Tuckasegee, including one above Bonas Defeat Gorge. Water from the reservoir is channeled downstream through a pipe and run through a powerhouse during periods of peak electrical demand. That has reduced the flow of water through Bonas Defeat Gorge to a trickle, exposing some of the most spectacular rock formations in the Southeast.

Another hundred yards and we are there. The small, windowless powerhouse — idle now in midday — stands to one side of a knee-deep pool of greenish water. Downstream from the powerhouse, the Tuckasegee looks like a coastal inlet at low tide. Upstream, it is a tangle of alder bushes growing amidst puddles of standing water.

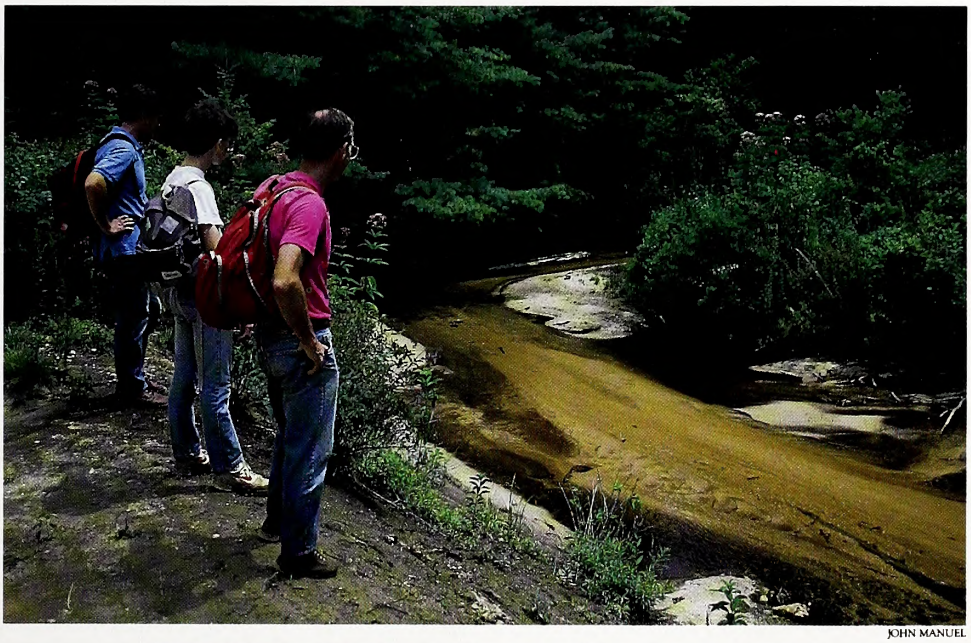
"This is it?" Alan asks. "This is the Tuckasegee?"

"I keep telling you, Alan. You're going to be amazed."

"Isn't there a trail anywhere?"

"No. The banks are too steep. It's rock hopping from here on out."

I take a blind step into the alders, and shudder as water pours into my boot. One thing for certain, the absence of a trail up Bonas Defeat Gorge probably ensures that it will never be overrun with tourists. In places, the bank widens out enough to allow for overland passage. But these sections are choked with rhododendron and nearly as impassable as the streambed. Alternately, hopping, crawling and slogging, we make our way upstream. The gorge widens and the first of dozens of rocky pools appears up ahead. These are not the typical pools of the Appalachians, formed of clusters of small, mossy boulders. The force of the water that once roared down this narrow defile has purged the streambed of anything smaller than a Volkswagen. Many sections have been worn down to bedrock — and then some.



JOHN MANUEL

JOHN MANUEL

***Though they are** high-elevation mountain streams, the headwaters of the Tuckasegee in Panthertown Valley flow like eastern blackwater streams in places. Because of their isolation and excellent water quality, they offer good brook trout fishing. This fisherman (left) prepares to release his catch.*

"Look at that," Alan says, pointing to my right. "It's some kind of pothole." He hops across the streambed until he reaches a pair of dark circles on the flat surface of the exposed bedrock.

"Incredible," he says. "They're absolutely perfect." The potholes look as if they had been made by a giant drillpress. The edges are razor sharp and perfectly round.

"This one is filled with tadpoles," says Alan. "And look, this one's got a little bass in it."

Dr. Gary White, professor of geomorphology at Western Carolina University, says the potholes in the Tuckasegee streambed were created over millions of years by gravel swirling around in pockets in the bedrock. These pieces of gravel, called "tools" by geologists, were eventually worn down to marble-shaped balls, many of which can still be found at the bottom of the potholes.

White says that only in very hard rock structures does one get perfectly round potholes such as in Bonas Defeat Gorge. And only where the streambed has been exposed can one truly appreciate the river's work. The potholes in Bonas Defeat Gorge do not present a serious hazard to hikers. What makes the one-mile hike difficult are the boulder fields which constrict the passage up the gorge. The way around these behemoths is not always clear, and first-time hikers may spend half an hour or more trying to figure out a route through certain areas. For this reason, first-time hikers should always go with someone familiar with the gorge. And the gorge should never be hiked alone.

After three hours of scrambling, swimming, and sunning, Alan and I come to a bend in the gorge that affords a wide view of the sky. Looking backward, we see a sheer rock wall rising 500 feet to a wooded crest. Legend has it that a hound named Bonas was chasing a deer through those woods and suddenly found himself clawing the air. Bonas' defeat was a horrible one, but it lent a striking name to a place deserving of one.

Another 15 minutes and we reach the long, waterless cascade below the dam that forms Tanasee Creek Reservoir. By itself, this natural staircase, nearly 100 feet high, could be a major tourist attraction. But here, it is just one more hill to climb. We make the final ascent out of the gorge and head for the car.

***Two hundred and fifty** years ago, when the first white men ventured into what is now central Jackson County, they came upon a*

DOWN THE TUCKASEGEE

JOHN MANUEL

At Dillsboro, *the Tuckasegee meets this small dam which temporarily stills and slows its waters. Then it enters a narrow, plunging gorge that provides an excellent whitewater canoeing stretch.*

Cherokee Indian town at the fork of a swift-flowing river. This was Tsiksi'tsi, a Cherokee word meaning "crawling terrapin." Whites dubbed the town and the river beside it "Tuckasegee."

A Cherokee visiting the present day town of Tuckasegee would find little to remind him of its Indian heritage. There is not even an historical marker identifying the site of the former Indian village. Depending upon the season and the time of day, he might not recognize the river either. From late afternoon to mid-morning in spring, summer, and fall, the 100-foot-wide riverbed lies largely exposed, deprived of most of its natural flow both by the small reservoirs on the east fork and by the giant Thorpe Reservoir on the west fork. But when the homes and factories on Duke Power Company's electric grid come to life, the floodgates open and the river swells.

Five miles upstream at the town of Dillsboro, the Tuckasegee River enters a narrow gorge that contains one of the finest stretches of intermediate whitewater in the state. The gorge features a non-stop array of Class I and II rapids, drops that require careful maneuvering and balance but not a high degree of risk. For decades, this stretch of river was badly polluted by the Mead Paper Company in Sylva, and, thus, it was rarely paddled. The mill was shut down in 1974, then reopened in 1982 as Jackson Paper Manufacturing—a relatively clean cardboard recycling operation. Today, an estimated 10,000 people paddle the Tuckasegee Gorge every year—most of them in canoes, rafts, and rubber duckies rented from James Jackson, owner of Tuckasegee River Outfitters located on U.S. 19-23, west of Dillsboro.

"Looks like the Thorpe Power Plant is shut off," Jackson says, eyeing the exposed rocks in midstream at the Dillsboro put-in. "But we had enough rain last night to make it possible to run the gorge. Let's hit it."

The trio of canoes slips into midstream with Jackson in the lead. From the outset, the current is swift. Half a mile downstream, we approach a railroad trestle that crosses the river and disappears into the side of a mountain.

"That's the Cowee Tunnel," Jackson says, pointing to the dark opening shrouded by trees. "It's a quarter mile long and was built entirely by convict labor using pickaxes. They used to run the convicts across the river in a flat boat pulling along a rope. One day the river was running high and the boat started taking on water upstream. The convicts crowded onto the other side of the boat, and it capsized. They were all in ankle chains and couldn't swim—19 of them drowned."

The swift current suddenly looks more ominous, and we brace ourselves for the first drop, appropriately named "Railroad Rapid." The canoes slide down the incline and bounce through a series of standing waves. Below "Railroad" the gorge narrows and the river picks up speed. In quick succession, we shoot through First Hole and Second Hole. Next comes Tanya's Rock, named after a friend of Jackson's who once wrapped her canoe around this Volkswagen-sized boulder. At the bottom of Moonshot, a covey of kayakers are paddling hard against the current, trying to surf the standing waves. Jackson says the Nantahala Outdoor Center takes most of its beginner and intermediate canoe and kayak classes to the Tuckasegee to avoid the crowds on the Nantahala. "You never have to fight for position on this river like you do over there," he says.

There are three more named rapids on the river interspersed by dozens of small ledges and boulder gardens. The river takes a turn to the north. In the distance, a steel trestle spans the river, its fresh coat of silver paint shining in the morning sunlight. The bridge marks the end of the gorge and our morning run.

We pass under the trestle and beach the canoes in the shadow of Jackson's store. Downstream the river widens and slows. It's another 20 miles from here to the confluence with Fontana Lake. I ask Jackson about canoeing that stretch.

"There are a few good rapids between here and Bryson City," he says, "but it's a pretty long haul. If you really want to see that stretch of river, I'd take the train."

With a blast of its air horn, engine number 777 pulls out of Dillsboro with a dozen carloads of passengers in tow. Hands reach through the windows of the red, yellow, and blue Pullman cars and wave to the tourists crowding the sidewalk along Front Street. Ten years ago, this street was largely deserted, half of the now bustling shops empty.

The economic revival of this old river town is largely due to the Great Smoky Mountain Railroad—an excursion train which follows the old "Murphy Branch" along the Tuckasegee and Nantahala rivers. The Murphy Branch was constructed in the 1880s to serve the isolated communities between Asheville and Murphy. But by the 1980s, the line had become uneconomical and was put up for sale by the Norfolk-Southern Railroad. Doug Ellis and Malcolm MacNeil, interested investors from North Carolina and Florida, came up to look at the line with the intention of selling it for scrap. But when they saw the spectacular scenery, they had a sudden change of heart.

"We rode the line between Sylva and Murphy and saw those beautiful rivers and mountains," says Ellis, now president of the Great Smoky Mountain Railroad. "We couldn't stand the thought of tearing the line up. That's when we came up with the idea of

JOHN MANUEL

***Downstream from** the rugged gorge, the Tuckasegee sweeps around Governor's Island on its way to Bryson City. This stretch of the river provides excellent fishing for a wide variety of gamefish.*

a tourist train."

Ellis and MacNeil assembled a team of investors and scoured the country for rolling stock. The state bought the line from Norfolk-Southern in July 1988 and leased it back to the Great Smoky Mountain Railroad. By the fall of 1988, the new train was ready to roll. Last year, the Great Smoky Mountain Railroad carried 160,000 passengers who spent approximately $8 million in the immediate area. Not only has the railroad revived the local economy, it has also given the little-known Tuckasegee River a measure of fame.

Half a mile out of Dillsboro, the train crosses the river and plunges into the Cowee Tunnel. For nearly five minutes, passengers cower in the dark while the conductor recites the tale of the tunnel's construction and the drowning of the chain gang. Emerging from the tunnel, the train runs through the forest above the Tuckasegee Gorge, then breaks into open country as it passes the Barker's Creek bridge. For the next 10 miles, the track hugs the southern bank of the Tuckasegee. Truck farming predominates where the floodplain widens, and the river runs slow and dark. When the hills close in, the river comes alive with roostertails of rushing, white foam.

At the town of Ela, the Tuckasegee is joined by the Oconaluftee River. "Ela" is a Cherokee word meaning "earth," but to Bob Dalley, it is synonymous with fish. Since he was hired as a professor of industrial engineering at Western Carolina University, Dalley has fallen in love with this stretch of the Tuskasegee.

"I've fished all over the world, and I can't think of any other river that holds such a variety of game fish," Dalley says. "There's one hole downstream from Ela where I've caught [walleye] pike, rainbow trout, and smallmouth bass. I've also caught largemouth bass, white bass, and brown trout in the river. I know there's muskellunge in there, but I haven't caught one yet."

What surprises Dalley as much as the variety of fish is the total absence of fishermen. "I may see one person every 20 or 30 times I go fishing," he says. "People stopped using the river when it became polluted by the paper mill, and they never came back after it was cleaned up. Also, it becomes impossible to fish when the turbines are turned on upstream. There's just too much water coming through." Dalley says the river is fishable if only one of the two generators at the Thorpe Power Plant is turned on. But he prefers to go out when both are shut off. Then he can float the river in a rubber raft, tossing crankbaits and jigs into the deeper pools.

A blast from the diesel's horn signifies the approach into Bryson City and the end of this leg of the Great Smoky Mountain Railroad. For all practical purposes, this is also the end of the Tuckasegee River. Below Bryson City, the river is stilled by the waters of Fontana Lake. Here, the bones of brook trout from Panthertown Valley, tiny round pebbles from Bonas Defeat Gorge, and the occasional canoer's hat from the Tuckasegee Gorge will finally come to rest. ☒

SAVING PANTHERTOWN VALLEY

It took an intense cooperative effort to save what some have called "Yosemite of the East." Today, this high valley with its rare plants, animals and wild brook trout serves as a living laboratory for future biologists and botanists.

written by Vic Venters
photographed by Ken Taylor

I have to admit that my first impressions of Panthertown Valley were somewhat disappointing. Often called the "Yosemite of the East," this sort of talk about Panthertown conjured up that grandeur, albeit on an eastern scale. To my untrained eye, however, Panthertown simply did not live up to that billing.

On the other hand, the biologists I was with could hardly have been more pleased. It is through their *trained* eyes that Panthertown Valley takes on its significance as an ecological treasure.

"For a scientist, Panthertown is extremely important," explained Alan Smith, a biologist who is cataloging the rare plants and animals found in the valley for the North Carolina Nature Conservancy. "Admittedly, this place really isn't as spectacular to the layman as some places in North Carolina. I mean it's not like Yosemite or the Joyce Kilmer area with great vistas. You have to look closer to see the real value of Panthertown."

Not that Panthertown Valley isn't pleasing to the eyes, even to my ignorant pair. Exposed granite cliffs, gleaming in the sun, surround the valley and tower 200 to 300 feet above the floor. From the summit, your gaze sweeps over a broad, lush green forest floor that unfolds until it meets cliffs on the valley's other side. Streams meander through, and the air holds the distant song of a stream dancing over falls. Except for Duke Power Company's transmission lines, signs of human disturbance appear minimal.

For biologists and scientists, Panthertown is, and will remain, an ecological oasis in a region of western North Carolina that is under intense pressure from resort and vacation home development. A drive through the neighboring Cashiers and Highlands area resembles nothing so much as a shopping center suburb of Atlanta or Charlotte. At one time, developers eyed Panthertown Valley and envisioned golf courses, vacation homes and

***Exposed granitic** domes loom over this mountain bog in Panthertown's broad valley floor. The valley holds some of the finest mountain bogs in the Southeast.*

condominiums. There was also talk of actually damming Panthertown Creek and creating a "scenic lake," a move that surely would have destroyed the bogs and the valley's unique biological and geological ecosystem.

Fortunately, Panthertown was spared this fate in November 1989 when the U.S. Forest Service purchased the 6,300-acre tract from the North Carolina Nature Conservancy in a complex land swap involving Duke Power Company.

The deal to acquire Panthertown Valley started back in 1986 when the Nature Conservancy began negotiations to purchase the tract from Liberty Life Insurance of Greenville, South Carolina. Instead, the conservation community was shocked and alarmed when Duke Power suddenly purchased the tract from under the negotiators for $10 million. The utility company needed the land to run a 230-kilovolt transmission line from its generating facilities at Jocassee to its recently acquired Nantahala Power and Light Company. Visions of intrusive power lines and gaping right-of-ways slashed through the forest filled many conservationists with horror. Even worse, it was feared the area might be sold to developers after Duke Power had run its lines.

The alarm, as it turned out, was somewhat premature. Duke Power's CEO, Bill Lee, solidified his reputation as an environmentally enlightened businessman and worked with conservationists to minimize environmental damage. The transmission lines were built, but land clearing for right-of-ways was kept to a minimum and the towers were routed through the valley in locations to make them as inconspicuous as possible. Darkened steel towers blend in with the scenery and, for the most part, are not silhouetted against the sky. Also, the power lines were strung by helicopters to keep disturbance to a minimum. Today, the towers are visible, but you have to look hard for them.

In 1989, Duke Power sold the land to the Nature Conservancy for about $7.9 million. The Nature Conservancy, in turn, immediately sold it to the U.S. Forest Service which added it to the Highlands Ranger District of the Nantahala National Forest. The Forest Service is managing the tract under its 4-C classification, meaning that commercial timber production is unlikely, if not impossible. Many of the old logging roads are being converted to trails while the area is now open to non-motorized traffic, hiking, primitive camping, fishing and hunting.

The unusually broad and flat valley floor of Panthertown is home to at least 11 different types of natural communities, including four very rare ones. These rare communities include two wetland types—the Southern Appalachian bog and the swamp forest-bog complex. The bogs found in the valley are of particular interest. Forming perhaps the largest collection of mountain bogs found south of West Virginia, Panthertown's extensive bog complexes are home to numerous rare plants.

Two other rare communities are Panthertown's trademark: high elevation granitic domes and spray cliffs, the rock walls found behind waterfalls. Many of the valley's rare mosses and liverworts are found on these rocks. The valley also holds at least 14 species of globally endangered plants and there are several spectacular waterfalls, including the well-known Schoolhouse Falls on Panthertown Creek.

Even without actual development, it's clear that Panthertown was plainly misused in the past. Like most other North Carolina mountain valleys, it was rapaciously logged in the early decades of the 20th century. Time has softened past wounds but there are still scars, slowly healing. Today, the bent steel spikes

Dr. Lewis Anderson, *a prominent bryologist from Duke University, examines a spray cliff behind a waterfall for rare mosses and lichens (above). Cuthbert's turtlehead* (Chelone cuthbertii) *is one of the rare flowering bog shrubs found in Panthertown (left). Apart from the rare species found there, Panthertown is important because it preserves a large tract of mountain habitat from development.*

that protrude from the rock bed of Panthertown Creek bear witness to the rail lines that once ran up the creek to haul lumber out of the valley. There have been repeated and severe fires in the valley. The flames raged so hot in some areas that the soil was sterilized, and the vegetation in places is patchy and scraggly. Most of the trees on the valley floor are young, and many of them are white pines, remains of abandoned Christmas tree plantations.

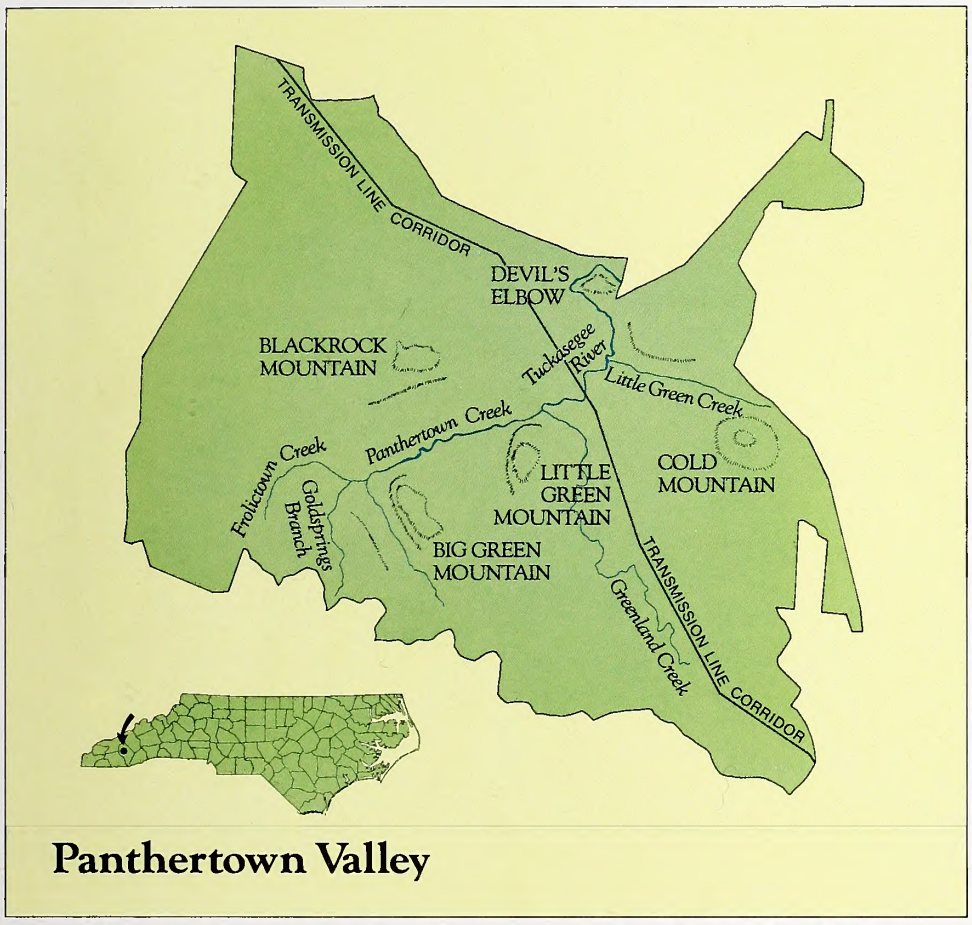
Only a few of the massive Canadian hemlocks that once forested the valley survive in small pockets or are scattered along stream banks. Most fell to the logging and fires that ravaged the original forests. However, hemlock stumps — some as large as 4 feet in diameter — remain as reminders. "Clearly, this is no virgin wilderness," Smith said.

But what is more important for biologists is that a large tract of unique habitat has been preserved. The lack of human habitation in the valley and the unbroken nature of the habitat will allow these scientists to study how large chunks of ecosystem function — something not always possible on Forest Service land that is being parceled and logged or private land pressured by development.

"Biologists really find this place unique," Smith said. "Just to have 6,000 acres, even if there wasn't a rare plant in it, would be significant. It's rare to find large blocks of habitat in the mountains anymore."

On a more visceral level, Panthertown also holds great interest for trout fishermen. According to surveys, the 20-plus miles of creeks and streams — such as Greenland Creek, Panthertown Creek, the headwaters of the Tuckasegee River — have excellent water quality and a high diversity of aquatic organisms. Consequently, Panthertown Valley holds some of the finest wild brook trout streams left in the Appalachians, preserved by their isolation. The broad, flat bottom of the valley has created unusual streams for the mountain region. Although the valley and streams are 3,000 feet above sea level, the streams in the valley floor have the characteristics of blackwater streams of eastern North Carolina — dark tannic water, white sand bottoms, and a calm, meandering character.

Last year, the area was opened to public



Panthertown Valley

fishing. Wild brook trout are among nature's most beautiful game fish; they are also among the most gullible, being very susceptible to overfishing. To protect this fragile resource, the N.C. Wildlife Resources Commission is managing the water and has placed all the creeks in Panthertown under catch-and-release and artificial-lure-only regulations. Both the Forest Service and the Wildlife Commission have also mounted extra enforcement efforts to prevent poaching.

Before the fishing season opened in 1990, electro-shocking surveys measured the size and number of the fish found in the streams. Later, the streams will be surveyed again to see if protective regulations are effectively protecting the resource. The Wildlife Commission is also managing the valley as a game land and a bear sanctuary, in which hunting is allowed for all game species, except bears.

While wildlife abounds in the uninhabited valley, the actual number of endangered wildlife species appears to be relatively low. However, the abundant bog complexes seem to offer excellent habitat for the endangered bog turtle, although they have not been found yet. Still, the green salamander, a federally endangered amphibian, has been found in the valley. Despite its namesake, panthers have almost certainly disappeared from the valley.

To protect the inherently fragile resource, Forest Service managers are trying to walk the fine line between providing access to the public and protecting the environment. One issue that may arise is that some of the rare plant species found in the valley also happen to be located in areas popular with visitors. There's the real possibility that some of the species could become "loved" to death.

"One potential danger to the area is overuse by the public," wrote Alan Smith in a report on the biological resources of the valley. "The rare plants on one set of falls grow within reach of people walking behind the falls and could be expected to be damaged or severely eliminated if many people visit the area. Such a fate has befallen Dry Falls on the Cullasaja River near Highlands."

To minimize the possibility of overuse, the U.S. Forest Service will not expand the recreational and camping facilities beyond the primitive stage. That will help, and regardless of any lingering problems, the long-term future of Panthertown Valley is brighter than it's been since man first entered the valley. ☒

***Although many of** Panthertown Valley's streams flow quietly through the flat valley floor, there are several spectacular waterfalls. Visitors should tread carefully around waterfalls so that rare plants are not harmed or disturbed.*

At odd times when I am caught in traffic or waiting in long check-out lines, my mind sometimes wanders to a favorite fishing spot in the river near my home. There are lots of redbreast sunfish there, and I know exactly where they hang out. I can almost see the rocks they favor, and I know the fish will often gather in unbelievably small spaces between two granite boulders.

It's easy to summon this pleasant daydream because I have been fishing this spot for more than half a century. I sometimes wonder if other fishermen long before me — perhaps a century ago — might have caught redbreast there, too. I'll bet they did. At least, I know I can, and that's how my daydream usually ends.

Redbreasts are very special fish. For one thing, they are incredibly handsome. With their brassy-green coloration, red or yellow breasts and long, slender ear (opercular) flaps, they are just downright pretty.

That's not their only attribute. Consider where they live. These are river sunfish, better adapted to moving water than bluegills, shellcrackers or most of their other sunfish cousins. I find them mostly in rivers with good water quality — the kind I grew up wading and swimming in.

Rivers of Robins

The brightly colored redbreast sunfish is widely distributed in North Carolina's streams and rivers, yet relatively few anglers seek these spunky panfish.

written and photographed by Eugene Hester

Maybe those pleasant boyhood experiences in search of these fish also have something to do with how I feel about them. As a kid, I explored the creeks for miles around. It was exciting and gave me valuable insights into the lives of these fish. I learned where they lived, what they ate and where they spawned.

I learned, too, about the time of year they are most active, and about their little migrations up and down the rivers. Yet, even after pursuing and observing these fish for 50 years, I still find them as intriguing and challenging as ever. Not surprisingly, by putting together all of these bits of information, and by exploring and experimenting, I have been able to find some good ways to catch these fish.

One thing that's immediately apparent is that local fishermen rarely call this fish a redbreast sunfish. They know it by more common names. Most fishermen in eastern North Carolina call it a robin, so named because of the beautiful red breast of the male. Sometimes you'll hear it called a river robin in recognition of where it lives. Other fishermen call this fish a yellowbelly, a nickname derived from the yellow breasts of the females.

There are many ways to catch robin sunfish, and regardless of what kind of equipment is used, success depends on the ability to place the right bait or lure in the right place at the right time. Perhaps the simplest way to catch robins is with a cane pole rigged with a size 8 hook, several split shot and a medium-size cork on monofilament line. Robins live in moving water and you may need a few extra split shot to get the bait down to the fish. When the fish are in deeper holes, under logs or hanging out near the base of a rock, extra weight helps maneuver the bait to the right spot despite the current.

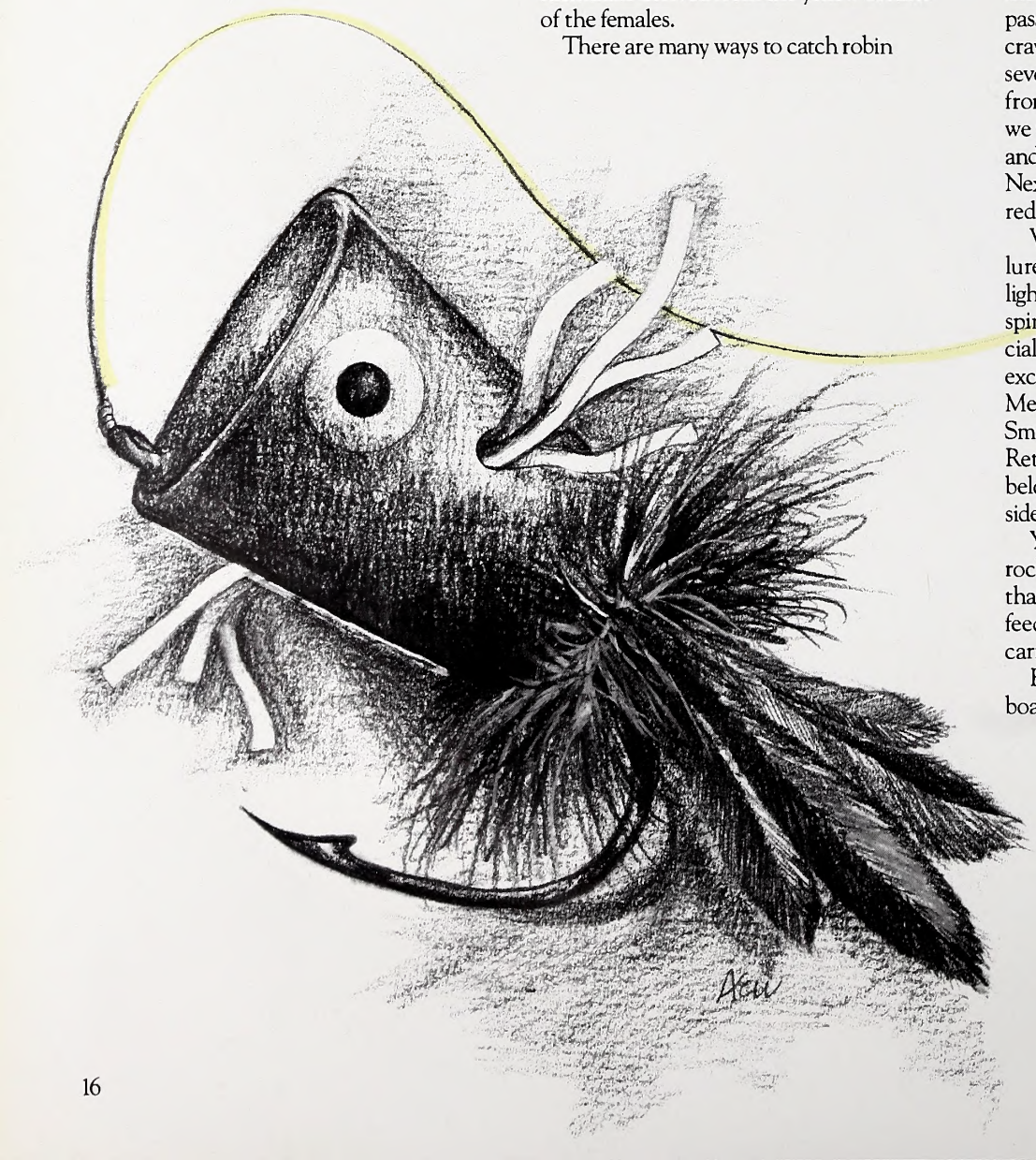
In swift current I drop the bait into the water several feet upstream from a likely hiding spot and let the current wash it downstream into position. I especially like to let it wash against a river boulder with the bait deep enough to be adjacent to hiding places at the boulder's base.

A robin will take many natural baits, but over the years my companions and I have found that these fish seem to have definite preferences. A small live crawfish about an inch long is ideal, for it's a rare robin that will pass one up. Next best is the tail of a large crawfish. If the tail is big enough, we cut it into several pieces and thereby get several baits from one crawfish. If we can't obtain crawfish, we use the tails of raw shrimp. They work well and we can get them at our seafood market. Next in descending order are live crickets and red wiggler worms.

While natural bait is more reliable, artificial lures also work well on robins. With an ultralight spinning rod and 4-pound test line, small spinning lures are ideal and some work especially well in fast currents. Small spinners are excellent, and three of my favorites are the Mepps, Panther Martin, and Roostertail. Smaller sizes—nos. 0, 1 or 2—work best. Retrieve them through the fast-moving water below a waterfall or rapids, especially alongside rock drop-offs or log jams.

You can expect the lure to get hung on rocks and logs. It is almost impossible to keep that from happening because robins live and feed in tight among the rocks and logs. Just carry some extra lures in case you lose a few.

Fishing by wading or from a small johnboat are my favorite methods. Not only are



***If you fish** the blackwater streams and rivers of the Coastal Plain with crickets or redworms (top right), the redbreast sunfish is very likely to be your favorite customer. These fish, however, are also numerous in streams throughout the Piedmont and are frequently caught in foothills and mountain streams. In the warmer months, they'll take artificial spinners and even popping bugs (right).*

they more productive, I also lose fewer lures. By fishing from the middle of the stream instead of the bank, I have more room to cast around overhanging tree limbs and can more easily get lures that become hung.

In addition to spinners, I also catch a lot of robins on lead-head crappie jigs and curly-tail plastic grubs. A lead-head jig weighing about 1/16th ounce works well for casting, and it sinks fast enough in moving water. I like to retrieve jigs slowly, bouncing them along the river bottom near hiding places. Very small spinning lures such as the Rebel Teeny Wee Crawfish or the smallest Rapala minnows also perform well.

Though cane poles and ultra-light spinning outfits catch most robins, my favorite method is with a flyrod and popping bug. In addition to being very effective, I get to see the fish strike on top. When robins are in the vicinity of their nesting area, they are especially aggressive and will strike a popping bug with such determination that they may actually leap out of the water as they strike. At the moment they hit the lure, they flare their gills and fins. That's not only exciting, it creates a unique sound.

My favorite flyrod popping bug is a size 6 or 8 solid yellow or red and white bug. Those with rubber legs work great. When retrieved slowly across the surface with a wiggling, twitching action, the bug imitates a struggling insect. Robins can seldom resist such a temptation.

Because of overhanging tree limbs, a relatively short (7- to 8-foot) flyrod with a weight-forward size 5 or 6 floating fly line is ideal for streams. Even shorter rods work well in very small, tightly canopied streams. The outfit you'd choose for small trout streams will be perfect, but you'll find that lines lighter than about a size 5 won't handle popping bugs.

Like most other sunfish, robins are not very active during the colder half of the year. Their activity increases as the water warms in the spring, and by May and June it's at its peak. Robins are on the move during these months looking for spawning sites and mates, and they're also hungry. In late summer, robins often become less active as the water gets warm and low. Activity picks up again in autumn, however, and September and October can provide excellent fishing.

For years, my brother William has contended that the full moon in May is the best time of the entire year to fish for robins. We have certainly caught a lot of fish at that time, but I have never been sure that this time was any better than a week or two earlier or later. At a minimum, we verified that all of May is just about tops.

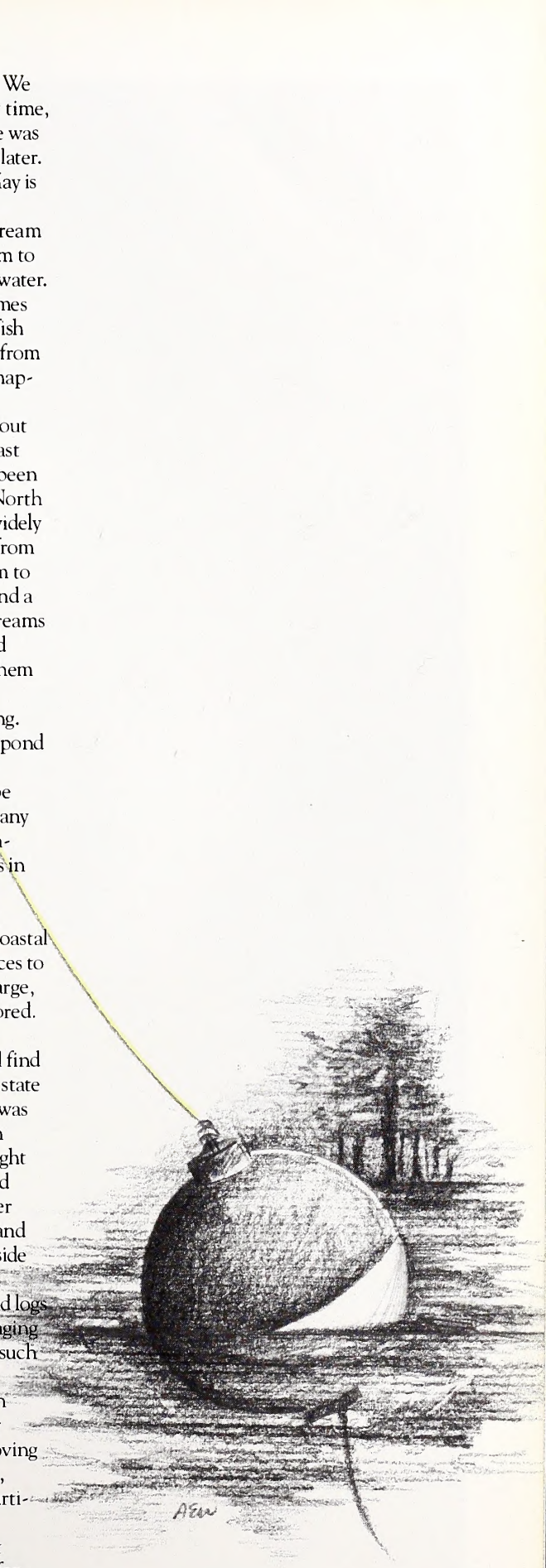
In the spring, robins often move upstream before spawning. These movements seem to be triggered by a spring rain and higher water. These upstream movements are sometimes blocked by old millpond dams, and the fish will often concentrate just downstream from these dams for several days. When this happens, fishing is superb.

Robins are native to streams throughout those states that border the Atlantic coast from Florida to Canada, and they have been introduced to streams farther west. In North Carolina, the robin is one of our most widely distributed gamefish, found in streams from the coast into the mountains. They seem to be abundant in streams with boulders and a noticeable current. There are a lot of streams that fit this description in Piedmont and western North Carolina, and many of them are ideal for drifting with a johnboat or canoe. Some are also just right for wading. A lot of these streams also have old millpond dams that were constructed a couple of centuries ago. The old millhouses may be little more than fading memories, but many of the dams are still in place and, as mentioned, these are almost always hotspots in the spring.

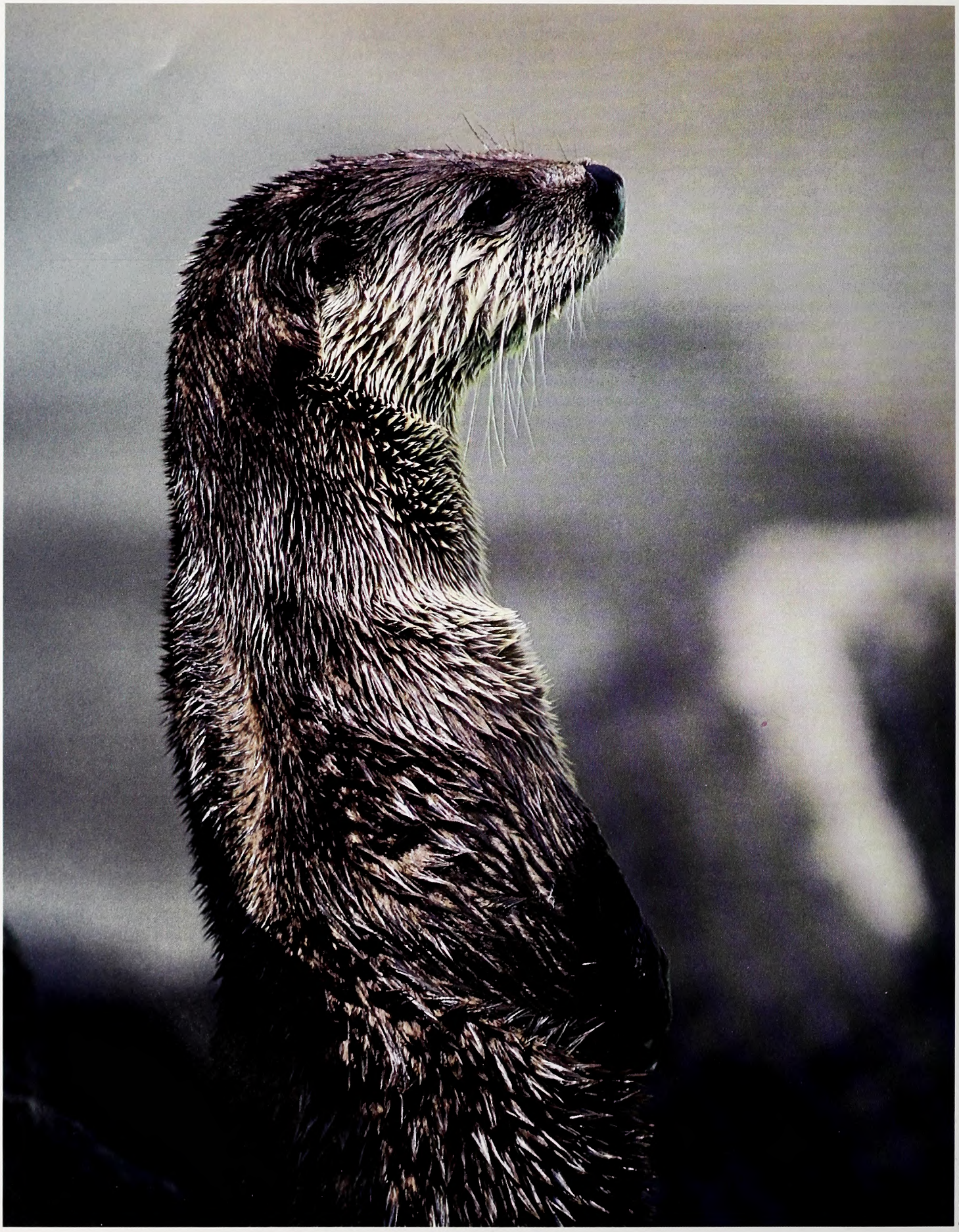
Robins are also very abundant in the black-water rivers and streams of the Coastal Plain. In addition to being beautiful places to visit, the fish in these waters are often large, abundant and especially beautifully colored. The Waccamaw and Lumber rivers are famous for their robin fishing, but you'll find robins even in the smaller streams. The state record for the largest redbreast sunfish was for a 1-pound, 12-ounce giant caught in Bladen County's Big Swamp. It was caught in May 1983 on a Beetle-Spin by Ronald Stanley. Generally speaking, coastal river robins also tend to favor moving water, and you'll often have your best luck on the side of the river that has the most current, especially near stumps, cypress roots and logs that lie close to the bank under overhanging limbs and foliage. A cricket flipped into such spots is deadly.

I've also caught robins in still water in coastal rivers and recall one particularly memorable day fishing a broad, slow-moving stretch of the Chowan River. You won't, however, find many robins in ponds or artificial lakes.

Don't let another spring pass without spending at least one balmy day fishing for robins. I can almost promise that you'll decide one day just isn't enough. ☒



For sheer fishing pleasure, *it would be hard to top a balmy afternoon on a river in May when sizeable redbreasts are hungry. A true one-pounder is considered a big one, and certainly more than a handful on a flyrod, ultra-light spinning outfit or a whippy cane pole.*



STEVE MASLOWSKI

Welcome Home, River Otters

After many years, otters are being restored to their former native rivers in western North Carolina, thanks to a live-trapping and relocation program by Wildlife Commission biologists.

by Mike Carraway

A canoe glides swiftly over rippling white water, weaving its way around rocks in the early morning light of a cool spring day. The pace slows as it slips over one last swell into a large pool of still water. The two fishermen survey the area looking for the best places to cast. Suddenly a splash downstream attracts their attention. Out of the water pops a slick brown head that glides through the water, then disappears in a swirl of bubbles. The fishermen sit quietly, not sure what kind of animal they have seen. It might have been a muskrat, a common furbearer in mountain rivers.

As they scan the area hoping for another glimpse, an animal slips quietly out of the water onto a large rock by the bank. It is too long and slender to be a muskrat, too large to be a mink. To one of the fishermen, the animal looks like one of the river otters he has observed on waterfowl hunting trips to the coast of North Carolina. A second animal slips out of the water and nuzzles the first. Then both scamper up the river bank and into the brush, one chasing the other. Now there is no doubt. The flattened head, thick neck, long slender body and the unmistakable gait identify the animals as river otters. The otters appear again on the bank farther away and slide down a steep trail back into the water. The fishermen watch as the otters glide across the pool and dive.

Sightings of river otters in the streams of western North Carolina — almost unheard of since the 1930s — will be much more common in the future. Wildlife biologists with the N.C. Wildlife Resources Commission are restoring otter populations to several western North Carolina river systems. So far, 23 river otters have been trapped and relocated to the Catawba River in Burke County, and 13 have been released on the Little Tennessee River in Swain County. Plans are to finish the restoration project on the Little Tennessee River and release otters in the French Broad River next year.

If these efforts succeed — and they should — they will mark another important victory in the restoration of species once native to western North Carolina. Otters were apparently common when European pioneers began to settle in the foothills and mountains of North Carolina in the 1700s. The early settlers lived off the land, hunting and trapping to provide food, clothing and furs for trading. Many wildlife species including beavers, fishers, wolves, mountain lions and river otters disappeared. Later, as commercial logging and industrial development increased, water quality in western North Carolina streams was degraded by siltation and industrial and municipal

Playful and intelligent, *the river otter will be a welcome resident in many western North Carolina streams in the years to come. Already 36 otters have been released by the N.C. Wildlife Resources Commission as part of a project to restore otters to their former range.*

KEN TAYLOR

***Live-trapped in eastern** North Carolina where populations are high, otters are then transported to the mountains. They are released in a single spot in groups to increase the possibility that they will remain near the restoration areas.*

waste discharges.

By 1900, otter populations were rare in much of the state, remaining stable only in the Coastal Plain. The last confirmed river otter sighting in western North Carolina occurred in a remote area of Haywood County in 1936. State regulations protecting river otters were first introduced in 1935 when harvest seasons were closed in western North Carolina. Populations in the Coastal Plain remained viable and later expanded westward into the Piedmont. Today, stable otter populations can be found in the eastern two-thirds of the state, but are absent from river systems in western North Carolina.

The river otter (*Lutra canadensis*) is a member of the mustelid family of mammals which includes skunks, weasels and mink. Otters are aquatic predators and can live in a variety of marine and freshwater habitats ranging from coastal areas to high mountain elevations. Good otter habitat is determined by the availability of shelter, food and water. Otters feed primarily on small fish and crayfish, but they also consume crabs, amphibians and a variety of other aquatic prey species. Research on food habits indicates that otters feed primarily on slower-moving fish species such as minnows, suckers and other rough fish because most game-fish species like trout and bass are fast swimmers, difficult for otters to catch. Some research has even indicated that otters might be beneficial to cold-water game fish by reducing populations of undesirable fish species that compete for food.

Otters are generally active at night, but they may occasionally be seen in early morning or evening hours. Dens are often burrows in the bank that are excavated by other animals, but they may also be located in log jams, natural cavities or thick vegetation. Dens, however, are temporary except when otters are raising young.

The breeding season for otters is in early spring. Females delay implantation for a period lasting from 290 to 380 days followed by an active pregnancy of 60 to 63 days. As a result of this delayed implantation, otter pups (or cubs) may be born more than a year after the female has bred. An average of two or three fully furred pups weighing 4 to 6 ounces are born helpless and blind. Their eyes open in 21 to 35 days, and the pups emerge from the den after about two months and are weaned after three to four months. Although juvenile otters are self-sufficient after five or six months, they generally remain with their mother until just before the birth of the next litter. Adult males do not assist with the rearing of the young. The young generally disperse at about eight months, but siblings may remain together for longer. Female otters do not reach sexual maturity until they are about 2 years old, and males may not be successful breeders until they are 5 to 7 years old.

Biologists believe that attempts to restore river otters to their former range in western North Carolina have a good chance to succeed. In earlier years, some rivers were badly polluted. Recently, however, waste-treatment plants and other efforts to control pollution have improved water quality in many rivers and streams, including the French Broad and Little Tennessee. Also, wildlife law enforcement has improved since otters were first protected in 1935.

In assessing the prospects for the river otter's return, Wildlife Commission biologists looked for suitable habitat. Each river system in the western part of the state was evaluated to see if it afforded necessary food, water quality, denning areas, isolation from human disturbance and adequate year-round water flow. As a result, 11 rivers were selected as potential restoration areas and rated according to habitat quality.

In many ways, restoring otters to western North Carolina's rivers parallels the highly successful restoration of the wild turkey to this region. Like turkeys, wild otters are live-trapped, moved and released in an area that has been selected as having the right habitat and other necessary characteristics. Biologists with the Commission's Division of Wildlife Management live-trapped the otters they needed from areas in the eastern part of the state where otter populations were good.

The trapping and handling of otters is carried out using techniques developed and refined by trappers in Louisiana. Some may find it ironic or hard to believe, but small No. 11 leghold traps have proved to be the most efficient for this purpose, and, properly used, these traps usually cause no injury, or, at worse, only a minor abrasion.

The goal of each restoration area is to relocate about 20 otters (10 males and 10 females) during a three-week period in January before the pups are born. Captured otters are kept in holding cages for about a week before transportation to release sites. Each otter is marked with one tag in an ear and another in the webbing between the toes of a hind foot. In addition, each is biomarked with an injection of tetracycline, which is deposited in bone tissue. Marking animals will enable wildlife biologists to determine if otters recovered in the restoration area were from the original releases. As many otters as possible are released together to increase the possibility that they may remain near the restoration areas.

The final phase involves monitoring each restoration area with periodic surveys. Wildlife biologists search release areas for sign — tracks, scats (droppings), and latrine sites — to determine if otters have remained in the

KEN TAYLOR

***Wildlife Commission** biologist Wib Owen (right) and a biologist from West Virginia watch as otters are released. Rivers were carefully screened to find the best otter habitat. The ultimate goal of the release program is to restore otters to 11 mountain rivers.*

restoration areas.

During a three-week period in January 1990, 15 river otters were relocated to a section of the Catawba River in Burke County. Two months later, at the request of a landowner, wildlife biologists captured a female otter denning under a house in Beaufort, along with two young otters only a few weeks old. The adult female was relocated to the Catawba River restoration area, and the two young otters, which were too small to relocate with the female, were raised by David Sawyer, a wildlife research technician in the New Bern area. Because they were too tame to release in the wild, they were donated to the Museum of Life and Science in Durham where they live in a specially designed otter habitat.

This year, otter trapping resumed in January, and seven otters were stocked at the Catawba River site to complete restoration of this area, bringing the total release here to 22 otters, nine females and 13 males. Also, 13 otters — four females and nine males — were relocated to the second restoration area on the Little Tennessee River in Swain County. The release of river otters on the Little Tennessee River complements otter restoration efforts begun in the Great Smoky Mountains National Park in 1986. Already, some of the otters released on the Tennessee side of the park have occupied habitat on Eagle Creek and Hazel Creek in North Carolina, both tributaries of the Little Tennessee River that flows into Fontana Lake.

Interest in the restoration of otters in western North Carolina has attracted considerable support. Recently, the Wildlife Commission received a $5,000 donation from Brad Stanback of the Salisbury Foundation — a non-profit organization dedicated to wildlife conservation and management — to use in river otter restoration.

Future plans for the otter project call for releases of live-trapped otters on some of the other rivers identified as having good potential habitat. Restoring the river otter to our western rivers will add diversity to these aquatic systems and help return them to the natural balance absent since colonial times. In other words, otters belong in these rivers.

But there's more to it than that. Like the fishermen in the canoe, those who encounter a family of these playful and secretive animals in the wild are unlikely to forget it. ⊡

Bugs, Sweat & Tears

But oh those sunrises! Actually, beach camping isn't always the same as being dipped in oil and rolled in sand. Take it from an expert who's learned the hard way.

written and photographed by Eddie Nickens

A friend of mine just couldn't understand it. Here is a man undaunted by the cruel twists of weather during the early weeks of trout season, a gent who braves bitter winds to tease December bass to bait. He is no stranger to a harsh environment. But he simply couldn't comprehend. "You're gonna camp on the beach?" this fellow asked, with all the vim and vigor of steamed toast. I sensed a shudder on the other end of the phone line. "Why don't you just wallow in Mazola and roll around in grits?" he suggested. "It's all the same thing."

How unfortunate, methinks, that for some timid souls a teaspoon of discomfort turns the sweetest drink to bitter ale. I'll not tell you that a night spent in the dunes of the Atlantic coast doesn't have its drawbacks, but a beach camping trip doesn't have to be a virtual sandfest. It is quite possible to spend the night on the beach without waking up and feeling like a human granola bar. There are no sunrises more beautiful than those viewed while your toes are on the edge of the continent and a path of sunlight shimmers across the ocean to your tent door. There are no lullabies so restful as Poseidon's endless tides. In fact, with a minimum of preparation, a camping trip to the undeveloped coast of North Carolina can be one of the state's finest outdoor experiences.

I said it *can* be. Basically, beach camping is no different from any other form of camping, except for the sand spurs, heat, lack of water and hordes of biting insects. Unfortunately, most of the following admonitions were learned from experience. For every lesson in these few words, I've suffered a half-dozen blisters or a soggy sleeping bag. Follow these suggestions and you'll be well on the way to a front row seat to the Tar Heel state's finest sights and sounds. Forget these words and misery will be your campmate.

Beach camping requires little specialized equipment and no more prowess than a night in the woods, but it does require attention to detail. Sandy soils demand longer tent spikes, and the flat terrain means tents may be buffeted by strong winds. Geodesic and dome tents may be your best bet, but an A-frame will suffice. Toss heavy items in the tent corners and drive stakes in deep. As for clothing, remember the lack of shelter and dress appropriately. While a pair of tennis shoes slipped on to bare feet are fine for hauling your pack from boat to campsite, longer walks demand more protection for your feet. Don double layers of wool socks under your lightweight boots, the better to protect against blisters in the sandy envi-

***A hike to a campsite** can be a pleasant excursion for intrepid beach campers. An endless variety of camping experiences is available to those who want to awaken to the sounds of waves and the sight of an ocean sunrise.*

***Sink stakes** deep in the sand if you want to avoid an unplanned wake-up call at midnight. Geodesic or dome tents are best bets to weather the wind. Where legal, sunset campfires can offer a magical end for a perfect day.*

ronment. And be sure to pack along a camp stove. Driftwood is in precious little supply along the Carolina coast, and some parks don't allow open fires.

This first homily is so important it should be embroidered on your rain fly — sand is your enemy. A single grain is like a Stealth bomber. Pay it no mind and it will be followed with waves of like particles. It's sort of like your long-ago Sunday School lesson: Boot sand begets tent sand; tent sand begets sleeping bag sand; sleeping bag sand begets body sand; body sand begets misery. Sand wreaks havoc with any moving part — your body included — so keep it out of tent pole joints, zippers, lanterns and stoves. Pay particular attention to tent door and window mosquito netting. Sand particles hide in the fine nylon weave, fraying seams and opening insect interstates if left to grind against each other.

I am fastidious about removing sand, to the irritation of my tentmates. Nothing beats a balled-up sock to whisk sand from the tent floor, and if the sock is a little damp with sweat, all the better. When pitching your tent, be sure to tuck the groundcloth under the edge of the tent. Sand that gets kicked on to any exposed groundcloth will make its way under your tent, there to grate and grind the floor of your $300 tent to shreds.

Fresh water drives out the sand devils. It comforts the mouth that feels like a slug with psoriasis. It cleanses coated equipment. It soothes the sweaty brow. And to top it all off, it doesn't taste too bad, provided it's relatively cool and not stored in a jug that last December was filled with venison chili. Carry plenty of water, more than you think you'll need. The experts say you can find fresh water 3 feet below the surface of most of the barrier islands, but you can be sure it won't taste like homemade.

Each November we throw a Masonboro Island campout and oyster roast. Sometimes as many as 50 folks show up, with half that number checking in for an overnighter. The first year we figured we'd relive our college days, and any liquid that didn't foam was in short supply. By day two, dehydration under a hot November sun nearly made us see camels. We learned the hard way that man does not live on malt beverage alone, especially when camping on the beach, and the next year there were so many Evian and Perrier bottles at our campsite you'd have thought we were opening a French restaurant.

That need for fresh water is a big component of the campsite location quandary. In some cases beach campers are bound by law — at Bear Island, for example, you must camp in designated sites — but often you'll be able to choose how close or how far from the water to pitch and whether to camp on the beach or in the dunes. A good rule of thumb is to camp near the beach in the open dunes in the spring, summer and early fall, and further inland only in late fall and winter. You'll want the beachfront breezes to hold down the bugs.

Keep in mind, however, that flats in the primary dune line might get flooded during high tides, especially during full moons. Once, when our traditional oyster roast campsite was taken by other campers, we pitched our tents on the edge of a peaceful marsh, backed by a high dune line that served as back rest and heat reflector. During the night our marsh turned to swash as the tides rolled in. Remember what I said about learning from experience?

Beach camping's finest hours are those spent watching the wildlife that inhabits the barrier islands, birds and animals that sometimes seem oblivious to man's presence. Pelicans skim the surf, sandpipers doze in a one-legged pose. The coast is like a window between two worlds, and the beach camper sits on the sill with a view unmatched by any other.

But not all of the coast's wildlife can be found in the plus column of a beach camping spreadsheet. Creepy crawlies are an unfortunate aspect of any camping trip, but beach bugs have a particular knack for being worrisome, wicked, unholy little beasts that can ruin an otherwise blissful beach trip. (That is, *female* beach bugs can be so ruthless. Male mosquitoes and flies quietly feed on pollen and plant juices, leaving the females to hound the human population unmercifully.)

Gird thy loins against these ghouls, and cover every other exposed chunk of personal real estate from ear lobe to ankle bone. Those sprawling salt marshes that so beautifully reflect each Carolina sunset also give birth to millions of mosquitoes, an army joined by no-see-ums, ticks and the dreaded greenhead, a.k.a., the horse fly. Wallow in bug spray, and pray for a light wind. My personal favorite anti-arachnid potion is Cutter's Maximum Strength or Muskol, both ointments laced with near 100-percent DEET, the stuff that's

supposed to wreak all grades of havoc with individual body cells. I couldn't care less. When the early evening wind dies on Core Banks, I'd spread liquid plutonium over my body if I thought it would help. Do not leave home without copious quantities of proven bug spray.

During the summer months, the evil is not limited to winged warriors. The tick problem on Shackleford Banks, according to Chuck Harris of the Cape Lookout National Seashore, is "horrendous." The particular tick species that carries Lyme disease has yet to be reported on the island, but "it's probably in our future," Harris says. When venturing off the sandy shore into the island's interior, wear long pants and sleeves, and consider taping your pant cuffs.

Bugs are, admittedly, the biggest drag of beach camping. Other wildlife, however, make the bug-swatting and sand-sweeping worth the effort, and the beach camper is treated to sights unseen by those who eschew a sandy mattress for a condo on the 14th floor. During summer, look for the tank tread-like tracks of a female loggerhead that has crawled from the sea to the beach to dig a nest and lay a clutch of perhaps 120 eggs the size and shape of ping-pong balls. The southern North Carolina coast is an important nesting area for the endangered turtles, so do not disturb. Keep light and commotion on the beach to a minimum during spring, summer and early fall. The turtles nest from May through August, and hatchlings may emerge as late as November.

Turtles aren't the only animals the beach camper has the honor of rubbing shoulders with and the duty of maintaining a safe distance from. Colony-nesting terns frequent the barrier islands, laying eggs in shallow depressions in the sand. Many of the nesting sites will be marked off-limits by state and federal personnel. Obey any restrictions, and report any unmarked nesting sites.

Sand, sunburn, squadrons of bugs — my message may read like a list of reasons *not* to go beach camping. Indeed, the unprepared seashore scout is a miserable creature. But heed my words and you might discover that a night in the dunes under the stars has few peers. The sea is a mirror for the Milky Way, tiny white lights twinkling in the waves amidst the faraway lights from the offshore shrimp trawlers. Don't worry about friends who call you crazy. That just means more of the beach to call your very own. ☐

Where To Pitch Camp

You're geared. You're gonzo. You're headed east. Here's a rundown of possible destinations.

Camping at the **Cape Hatteras National Seashore** is permitted in designated campgrounds only. Five public campgrounds are located on the most famous of North Carolina's barrier islands. Located at Oregon Inlet, Cape Point, Ocracoke, Frisco and Salvo, the campgrounds can handle tents, trailers and motor homes. All have modern restrooms, potable water, unheated showers, grills and tables. No utility connections are available. The Salvo campground abuts the sound; all others are on the beach side of the island.

If you doubt the popularity of beach camping, try finding a campsite on Hatteras during a summer weekend. Sites at the Ocracoke campground may be reserved from Memorial Day weekend through Labor Day weekend by contacting Ticketron outlets (by mail, P.O. Box 62420, Virginia Beach, VA 23462; by phone, 1-900-370-7070). All other campgrounds are on a first-come, first-served basis. For more information on the public facilities at Cape Hatteras, contact National Seashore headquarters at Route 1, Box 675, Manteo, NC 27954; (919) 473-2111.

On the south side of Ocracoke Inlet begins the **Cape Lookout National Seashore,** a 55-mile stretch of barrier island that offers the most remote (read "finest") beach camping along the East Coast. Portsmouth Village, located at the northern terminus of the island, is closed to camping, but the rest of the islands are open to primitive camping year round. There are a few rules. Campsites must not be within 200 yards of buildings, and wood fires are allowed *only* below the high tide mark, not in the dunes. Potable water is located near the head of the island and near the lighthouse, but this water supply is heavily iodized and can make for a rough glass of iced tea. Campers are advised to bring whatever water they will need with them.

A host of concessionaires offer ferry service to the roadless Cape Lookout National Seashore. The ferries, which can carry walking traffic and vehicles, depart from Harkers Island, Davis, Atlantic, Ocracoke, Beaufort and Atlantic Beach. National Seashore personnel do not set rates or schedules, but a list of ferry services and other information is available from Lookout headquarters. Contact the National Seashore offices at 3601 Bridges Street, Suite F, Morehead City, NC 28557-2913; (919) 240-1409.

South of Bogue Inlet is **Hammocks Beach State Park.** The Park is comprised of Bear Island, a roadless chunk of salt marsh, estuarine creek and four mile sandy beach. Primitive, backpack type camping is allowed in 14 individual and three group sites. Restroom facilities and running water are available from March 15 to December 15. Campers must register at the park office before going to the island. Two 36-passenger ferries operate between the mainland and Bear Island. Get there early, as the sites are full nearly every weekend during spring and summer. Only the group sites can be reserved. No wood fires are allowed, and the park is closed to camping during the three nights of the full moon in June, July and August when turtle nesting peaks. For more information, contact the park at 14000 Hammock Beach Road, Swansboro, NC 28584; (919) 326-4881.

Masonboro Island, located near Wrightsville Beach, has long been a favorite camping spot of locals who know where to go and how to get there. All camping is primitive, and no facilities are available. Access is by boat only.

Though not on the ocean, the 83 campsites at **Carolina Beach State Park** may be of interest to coastal campers. The state park runs a small marina that offers boat access to the Cape Fear River and the sounds and estaurine creeks behind Masonboro Island. Contact the park at P.O. Box 475, Carolina Beach, NC 28428; (919) 458-8206.

Program Focuses on "Duck Factory" Region

Pothole Adoption Program Launched to Save Ducks in Midwest

Written and Edited by Vic Venters

Among sportsmen concerned for North America's dwindling waterfowl population, there seems to be a common assumption that once rains return to the drought-stricken prairie states, waterfowl numbers will automatically rebound as they have in the past.

Unfortunately, rain alone will not bring back the ducks. During the last decade, pothole draining and intensive agricultural practices have greatly reduced the amount of habitat needed for maintaining waterfowl populations. If and when the rain returns, no amount of water will help ducks if their breeding grounds have been converted to grain fields.

While we are far from the problem here in North Carolina, Tar Heel sportsmen can help by donating to a new program that tackles the problem head-on in the prairie pothole region — North America's "duck factory."

Last fall, the North American Wildlife Foundation (NAWF) unveiled its "Adopt a Pothole" program. In essence, the plan allows individuals or groups to adopt individual potholes on an annual basis, paying the farmer or landowner each year to keep their potholes instead of plowing the breeding habitat under.

This spring is the first breeding season that the "Adopt A Pothole" program will be operational. "We will adopt roughly 1,000 potholes this spring," said Charles Potter, executive vice president of the North American Wildlife Foundation. "To make our money go farther, only potholes in danger of being drained or impacted by agricultural practices will be adopted."

The North American Wildlife Foundation hopes to expand the program with private donations and is cooperating with numerous waterfowl and conservation groups, Potter said. However, the "Adopt A Pothole" program differs from the work of some conservation groups in that it directly pays landowners to preserve ducks on private land.

"The most important thing to realize is that private farmers own the continental duck factory," Potter said. "Unfortunately, ducks are in competition with grain and they are losing out. If we are going to bring back ducks, we will have to offer the landowner an incentive to raise them. Unless there is value to the farmer in raising ducks, they cannot be expected to keep the potholes the ducks need."

The prairie pothole region — North and South Dakota, eastern Montana, northern Iowa, western Minnesota and the southern portions of Canada's Manitoba, Saskatchewan and Alberta — produces 80 percent of North America's ducks. And up to 95 percent of those ducks are produced on private farmland in this area.

In the past, landowners have received little financial incentive to maintain the breeding potholes. As a result, millions of potholes have been drained and put into agricultural production in the last 15 years. In the early- to mid-1970s, for example, there were about 6 million potholes in the prairies. Today, only 4 million potholes remain and about half are currently adversely affected by agricultural activities, NAWF officials said. Often, farmers plow up to waters' edge or otherwise alter the vegetation and cover needed for successful waterfowl reproduction. Combined with a decade of dry weather, duck populations have plummeted to historic lows in the 1980s.

LEONARD LEE RUE

Pothole Product: *North America's pothole region produces about 80 percent of the continental duck population. You can help restore our dwindling duck populations by contributing to the North American Wildlife Foundation's "Adopt A Pothole" Program.*

While habitat protection is the chief focus, the program will also encourage selective management of raccoons, foxes and skunks around adopted potholes. As habitat has decreased, both ducks and mammalian predators have been crowded into the same confines, with waterfowl losing out. In some potholes, breeding success has dropped to a level between 4 and 10 percent, well below the 15 percent level needed to keep populations stable. In areas of Montana where experimental predator-management projects have been tried, nesting success has jumped to 44 percent, a level at which duck populations flourish.

A one-acre pothole and associated nesting cover in Manitoba can be adopted for $100 annually. A two-acre pothole can be adopted for $200. A pothole complex costs $500. It's estimated that a one-acre pothole and associated nesting cover in prime Minnedosa, Manitoba pothole country will produce 10 mallard ducklings; a two-acre pothole, 20 ducklings; and a pothole complex as many as 50 mallards. All potholes should also produce a number of other duck species as well. Where possible, adopted potholes will have nesting baskets erected.

All individuals or groups adopting a pothole will receive a certificate and a picture of their pothole complete with a description of its location and the landowner's name. In addition, each adopter will receive two reports annually on the pothole's condition and duck production.

The North American Wildlife Foundation was founded in 1911 by sportsmen and conservationists to enhance knowledge of waterfowl and wetlands and has operated the Delta Waterfowl and Wetlands Research Station since 1938.

For information on how you or your group can adopt a pothole, write to the North American Wildlife Foundation/ Adopt A Pothole Program, 102 Wilmot Road, Suite 410, Deerfield, IL 60015.

Funds Go to Education

Business Helps State Parks

North Carolina's financially ailing state parks system will get some needed monetary help thanks to Carolina Power & Light Company's new "Adopt State Parks Program."

The Raleigh-based utility company donated $144,000 to its new program to be used over a four-year period from 1991 to 1994. The "Adopt State Parks Program" will provide support for environmental education, volunteer programs and a grant program challenging other industries and businesses to adopt North Carolina state parks.

North Carolina's system of 34 state parks is considered badly underfunded compared to other states, with our parks program ranking last in the nation in per capita funding. The CP&L donation will allow the Division of Parks and Recreation for the first time to publish teacher handbooks, student workbooks and other support materials about state parks. In connection with the state park system's 75th anniversary, CP&L will also sponsor three environmental symposiums during the year.

A portion of CP&L's funding will be in a series of matching grants as challenges to encourage other businesses — large or small — to help fund the parks system. To handle this, a "Business Adopts State Parks" (BASP) program has been created that will complement the existing "Adopt State Parks Program."

For more information on how you or your business can help through "Adopt State Parks Program" or "Business Adopts State Parks," contact John Poole, Division of Parks and Recreation, P.O. Box 27687, Archdale Building, Raleigh, NC 27611-7687.

Hoofs on the Roofs

Dancing Doe Damages Vehicles

In most incidents involving deer and vehicles, the deer usually comes out on the losing end of the encounter.

But not in Statesville last winter, as a local car auction business will attest. Last January, Wildlife Commission area Sergeant Brad Thorson received an unusual call from the Statesville Auto Auction. It seems that a deer was jumping over an 8-foot chain link fence surrounding a 60-acre parking lot and was jumping from car to car, damaging some in the process.

At first, Thorson said he was skeptical, but repeated incidents proved otherwise. In a two-week period, a doe jumped the fence four to six times, damaging at least 12 cars and causing at least $2,000 in damage. On one occasion the deer slipped when it was atop a vehicle, knocking a hole through its hood.

What makes the incident all the more mysterious is that the parking lot contained only gravel, asphalt and cars — no grass or other food. After two weeks, the car auction owners were about fed up with the doe's antics and were going to have to trap or destroy the deer. Fortunately, for both parties involved, the deer stopped. Call this case the "revenge of the deer."

Fish Will Grow Bigger

New Crappie Regulations Set

A new regulation passed this winter should allow fishermen to take home bigger crappies from four North Carolina lakes in the future.

The new rule will set an 8-inch length limit and a 20-fish daily creel for crappie in Badin, Tillery, Tuckertown and Falls lakes. A four-year study of the crappie populations in those lakes indicated heavy fishing pressure. The large harvest was preventing many crappie from reaching bigger sizes. The new regulation should correct the problem.

"In waters where crappie populations are heavily fished, delaying the harvest of the fish until they grow bigger will mean an important increase in the weight of the fish harvested," said Scott Van Horn, fisheries biologist with the N.C. Wildlife Resources Commission. "Most crappie fishermen are interested in pounds of flesh going home in the cooler, rather than numbers. As fish grow longer, they have an increasing capacity to get much heavier."

Until this law passed, there were no size or creel limits for crappie fishing in North Carolina.

—Angela Dorman Hill

Crappie Counts: *New regulations enacted this winter should produce larger crappie on four North Carolina lakes in the future.*

Forestry Association Wants Positive Articles

U.S. Fish and Wildlife Service Praises Articles on Wetlands

Dear Editors:

Thank you for the articles entitled *Forestry Under Fire,* Part I: "Wetlands and Pine Plantations," and Part II: "Can Wetland Forestry Survive?" which appeared in the November and December issues, respectively. The publication of these articles is timely and will help enlighten your readers regarding viewpoints on both sides of an important debate in the natural resource management community in North Carolina and throughout the southeastern United States. We commend the author and the editors for a balanced, objective presentation of the facts.

We agree that, in general, silviculture has fewer adverse environmental effects on fish and wildlife resources than many other land-use alternatives, but we also believe that it results in ecosystem changes that may have long-term environmental implications. These changes vary widely due to the variability of still-evolving forestry management techniques. However, statistically significant changes in hydrology, water quality and fish and wildlife habitat occur when site-specific values are measured against pre-project conditions.

A major concern to the U.S. Fish and Wildlife Service is the potential that conversions of wetlands to tree (e.g. pine, sycamore) plantations may decrease the number of fish and wildlife species which use the affected habitats. Similarly, increases in runoff rates and reductions in water quality entering primary nursery areas (for shellfish and fish) can reduce the use of these habitats by important commercial and recreational fishery species.

We encourage you to continue the important dialogue about this and other issues relating to fish and wildlife habitat use and management. Presentation of the facts surrounding such issues in *Wildlife in North Carolina* is one important means of developing solutions which benefit all parties concerned.

L.K. Mike Gantt
Supervisor, Fish and Wildlife Enhancement
U.S. Fish and Wildlife Service
Raleigh Field Office

Dear Editors:

I want to address two items that appeared in your November 1990 issue. The first was the *Nature's Ways* article, "Woodsman, Spare that Tree!" You correctly point out the many values that dead trees and snags in a forest serve for wildlife. You then say that managed forests are less desirable for wildlife than natural forests and imply that "managers" go about their business with no thought for providing for wildlife. This is not correct. Properly managed forests often provide equal, if not better, wildlife habitat than "natural" or unmanaged forests.

Providing den trees and snags has long been a part of forest management. In some cases, landowners will establish them by killing living trees. Sound forest management has proven to be compatible with, and often enhances, wildlife.

The other point has to do with a letter concerning logging and sedimentation on the New River. Logging and other forest management activities are not exempt from the law. All forestry activities are subject to compliance with defined state water quality standards under a law passed, at the request of the N.C. Forestry Association, in 1989. Such activities are exempt from filing of an erosion control plan as long as they meet the defined water quality standards.

I hope at some point you will do a story about the positive contributions and actions of forestry and forest landowners.

Robert W. Slocum
Executive Vice President
N.C. Forestry Association

Rucker Praised For Barney Article

Dear Editors:

I had the privilege of knowing Barney ("The Barney Years," February 1991) during the last three years of his North Carolina world. Some moments spent with him, and his partner John Rucker, included camping in the Smokies, fly fishing the Cataloochie, and hiking in the Uwharries. Barney was everything Rucker has written about him—and more.

If there is ever a Robert Ruark Award for writing, John Rucker deserves to be the first recipient.

G. Nicholas Hancock
Asheboro

Opens This Summer in Raleigh

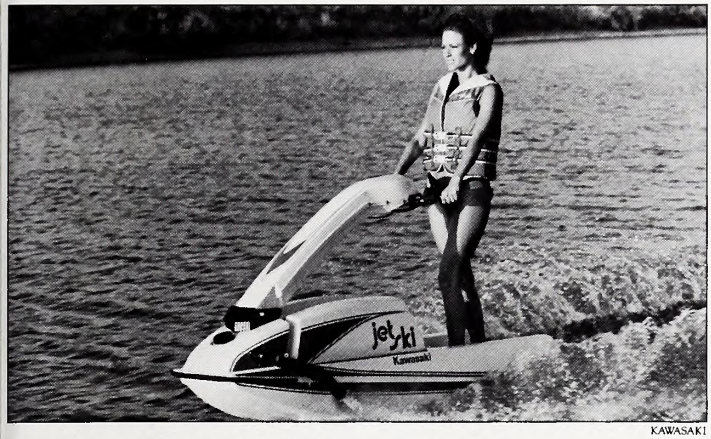
Trout Exhibit Comes to Museum

STEVEN A. WILSON

Fishy Business: *Judy Eure, president of the Triangle Fly Fishers chapter of Trout Unlimited (left), presents Dr. Betsy Bennett, director of the N.C. Museum of Natural Sciences, with a check for $500 toward the new cold-water and trout aquarium exhibit at the museum. Funding for the museum's new exhibit was provided by Triangle Fly Fishers and the N.C. Trout Unlimited state council, with major contributions also provided by the N.C. Wildlife Federation, the N.C. Wildlife Resources Commission and WRAL-TV. The exhibit is expected to open this summer.*

Boating Laws Apply to All

Personal Watercraft Complaints Rising



KAWASAKI

No Wake, No Exceptions: *All boaters — including personal watercraft operators — must obey state boating regulations, including no-wake zone rules.*

Just because personal watercraft don't look like boats doesn't mean that operators can ignore North Carolina boating laws. Personal watercraft — marketed under such names as Jet Ski and Wave Runner — have been involved in numerous accidents in North Carolina and other states and have increasingly become the subject of complaints from other boat owners.

"We've had a lot of complaints about them operating around boating-access areas," said Don Tobaben, program manager for the Wildlife Commission's Division of Boating and Inland Fisheries. "A lot of these users like to jump boat wakes and when boats slow down as they approach no-wake zones, some operators try to jump the wakes caused by the boats slowing down. This is illegal and of concern to us because these access areas are congested and there's a possibility for accidents. We've had incidents where they've run into boats or vice versa."

Personal watercraft have become increasingly popular in recent years with about 3,000 registered in North Carolina. Personal watercraft operators are urged to obey all state boating regulations and operate safely and responsibly around other boaters. Watercraft must carry personal flotation devices and must obey no-wake regulations.

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Calendar

On several occasions, events in this calendar have been changed without notice. Readers should check the contact before traveling to an event. Listings for the calendar should be sent at least four months in advance.

May 18-19

Spring meeting of the North Carolina Herpetological Society will be held at UNC-Asheville. All persons with an interest in reptiles and amphibians are welcome to attend. For more information, contact N.C. Herpetological Society, P.O. Box 27647, Raleigh, NC 27611, or call (919) 733-7450.

May 11

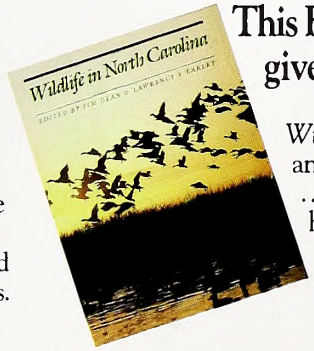
Workshop for quail management will be presented by Contentnea Creek Chapter and N.C. State Council of Quail Unlimited in the Greene County Office Complex near Snow Hill. For more information, contact Dave Heeter, 2012 St. Mary's St., Raleigh, NC 27608, or call (919) 834-8694.

Through May 12

Exhibition of paintings by Robert B. Dance at the Southeastern Center for Contemporary Art. For more information, contact SCCA, 7550 Marguerite Drive, Winston-Salem, NC 27016, or call (919) 725-1904.

June 3-9

Events and fishing clinics for National Fishing Week held around the state. Check your local papers for events or call the Wildlife Commission's Division of Boating and Inland Fisheries at (919) 733-3633 for more information.



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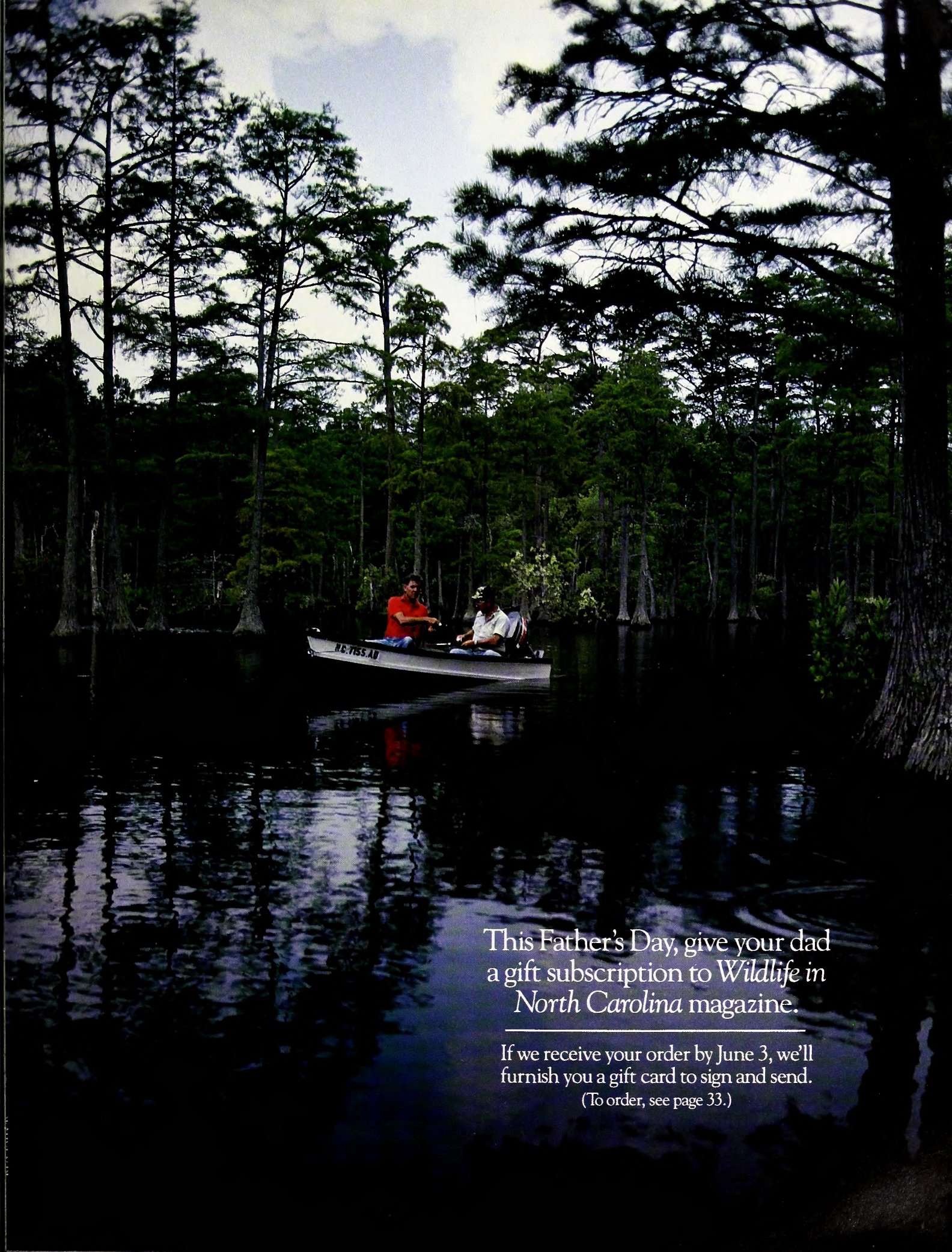
Planting Food, Harvesting Bass and Feeding Birds

by Vic Venters

Annual Plantings: It's time to plant annual food crops for small game. First, however, you'll want to conduct an inventory of your land to determine if food plots are really needed. They are beneficial only if brood habitat or winter food supplies are limited. If you find you do need to plant, the next step is to decide what food types are most appropriate. Two excellent types of annual food are the varieties of sorghum and hybrid pearl millet. This type of millet, with its thick stalk, provides good food and cover throughout the winter months. With plantings, you should also consider your local deer population. If you've got a heavy deer population, steer clear of soybeans and peas. They'll quickly be eaten. It's also important to locate plots in areas where you will not expose rabbits or birds to excessive predation. Don't locate plots in the open; instead, pick areas surrounded by thick grass, weeds or suitable cover. The surrounding cover should be at least as wide as the plot.

Harvest Strategies: May is one of the best months for fishing but be sure not to keep too many of the bass you catch in the farm ponds you fish. Overharvesting bass can ruin a good pond by allowing sunfish to overpopulate the pond. The result will be stunted bream and a shortage of bass. Generally, bass do not reach sexual maturity until they are about 12 or 14 inches. To ensure that you've got enough mature breeders, bass under this size should be released. Generally, you should attempt to harvest 4 to 5 pounds of sunfish for every pound of bass you keep per year. Unfertilized ponds that receive agricultural runoff can support about 20 to 25 pounds of bass harvest per pond acre per year. In infertile ponds, only 10 to 15 pounds per pond acre should be taken per year. If your pond is properly fertilized, harvest rates can safely be doubled.

Bird Feeders: If you continue to feed song birds through the warmer months, be sure to keep your bird feeder clean. High concentrations of birds around a feeder can spread disease and the feeders can become contaminated, especially in the warmer months when hot weather promotes the spread of the disease. An intestinal infection known as *salmonellosis* can spread through fecal droppings, with sparrows and finches especially susceptible. Ideally, it's best to clean your feeder weekly, removing moldy seeds and fecal droppings. Also, remove accumulations of spilled seeds and fecal droppings from the porch or ground under the feeder as this can promote fungal diseases. Feeders can be disinfected by cleaning with a weak solution of bleach. Be sure the feeder is rinsed off and dry before you add seeds again. Although there's nothing wrong with it, there's actually little need to feed most song birds in the spring and summer because natural food is abundant.



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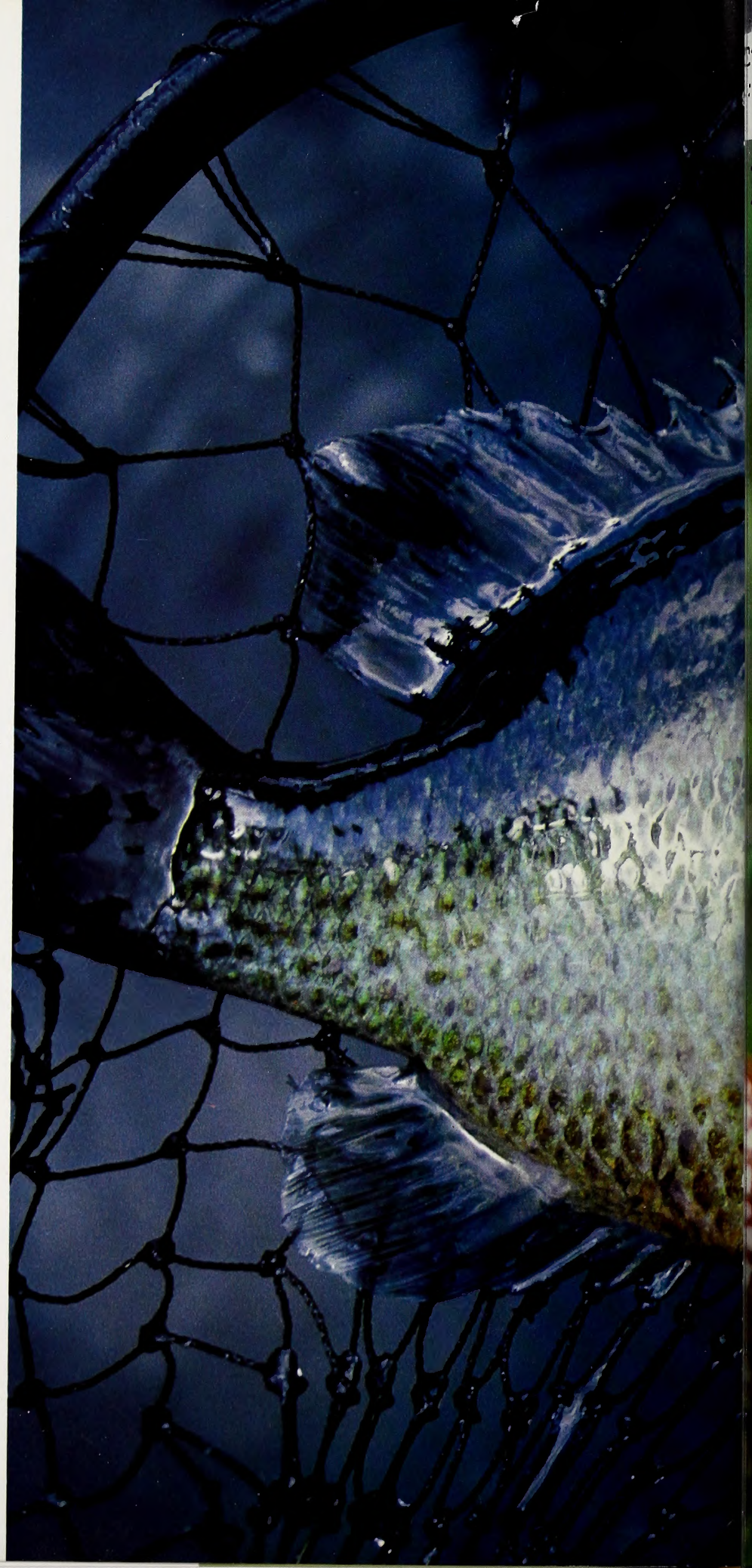
If we receive your order by June 3, we'll furnish you a gift card to sign and send.

(To order, see page 33.)



Radiant Redbreast

The varied colors of this still-dripping redbreast sunfish show why many fishermen consider it the most handsome freshwater species in the state.

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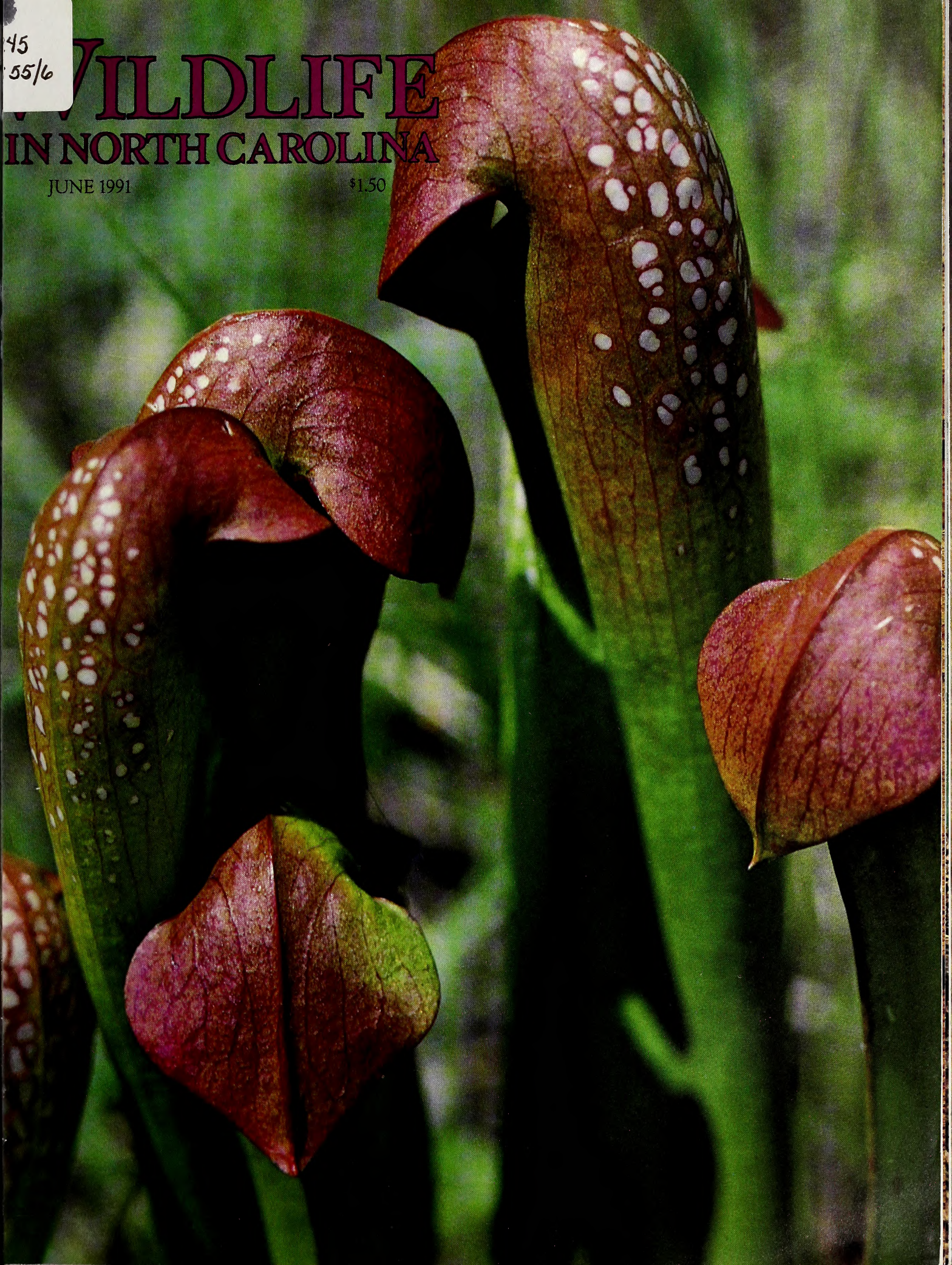

Just Floundering Around

by Jim Dean

It was one of those blazing summer days at the beach when insects rasp in the baking sea oats and it's too hot to walk on the sand. My son Scott and I made the best of it by sitting in the shade and eating home-grown tomatoes on soft, white bread with lots of mayonnaise and pepper. But we finally ran out of tomatoes and had to go fishing. Life can be tough sometimes.

White spoilbanks slid past on either side as we steered the boat down the Intracoastal Waterway towards the inlet. If there were flounders in the area, we knew they'd gather on the shoals to ambush minnows and shrimp carried out on the falling tide. But first, we headed for a flooded marsh behind the inlet where we knew we'd find schools of finger mullet for live bait.

JIM DEAN

You can tell a lot about people by the skills they seek to master. Some people aspire to be concert pianists or celebrated artists. I'd just once like to throw a modest 6-foot castnet that opens in a more or less circular fashion and have it drop as intended over a school of bait. In this quest, I have extended the patience of a multitude of instructors and spent untold hours in practice. The only fruit I can show for this is a banana. That's the disparaging term used to describe a net that does not open, but arrives at its destination pretty much as it left the hand—in an elongated wad. Worse, this is apparently a failing that can be inherited.

"Something's wrong with your net," Scott said after his careful stalks and heaves produced only a few broken oyster shells and a startled hermit crab. All around us, schools of petrified mullet pelted by banana bombs raced through the shallow tidal pool.

"Yes, it's defective," I allowed. "All castnets are defective. A castnet is just a theory anyway, you know."

Finally, by sheer determination, Scott was able to capure enough mullet to fish with. At the inlet, shafts of sunlight penetrated the incredibly clear water, and we could see the rippled bottom and shells at depths of nearly 10 feet. Several times, we were able to watch a flounder throw back its sandy quilt and snag a minnow as we dragged it past. By late afternoon when the tide grew slack and the action ceased, we had half a dozen nice flounders in the cooler, and we'd tossed back several others under the 13-inch minimum size limit.

Truly, flounders are wonderful fish. A bit of skill is needed to catch them, but not too much, and once hooked, they put up a surprisingly strong fight. With both eyes on the same side of the head, you could hardly call them handsome, but you can improve their appearance with a dab of butter, lemon juice, a sprinkling of fresh dill and a 5-minute respite under the broiler.

Flounder fishing begins to pick up in late spring and tends to improve gradually through the summer, peaking in September and October. Most fishermen use live bait such as finger mullet or mud minnows, but live shrimp are considered tops. Around inlets, anglers often drift in boats with the falling tide, dragging a live minnow on the bottom behind an egg sinker. The sinker, usually ½ ounce, is threaded on the line above a swivel, and a 2-foot leader with a flounder hook is tied behind the swivel. You can also cast such a rig from the shore at inlets or from piers. In the surf, you're likely to make your best catches close in under the shorebreak.

Live bait isn't always available, but that needn't put you out of action. Flounders will readily eat strips of squid or shark belly. Indeed, a 3-inch strip of flounder belly is one of the best baits. When a flounder bites, it's generally a good idea to give it a bit of slack line or at least delay the strike for a few moments. In that sense, it is similar to fishing for largemouth bass with a plastic worm.

If you prefer a more scientific approach, you can catch flounders on artificial grubs and jigs (especially tipped with squid). One of the biggest flounders I ever caught was skillfully apprehended when the Porter Seahawk I was using sank to the bottom while I was picking out a backlash. I've also had good luck at times wading the edges of inlets with a flyrod and a sinking flyline. Any streamer that resembles a minnow is likely to draw a strike. If that doesn't work, try replacing the fly with a bare hook and bait it with a strip of squid. The squid is fairly tough and stays on the hook nicely.

Many anglers also gig flounders at night under a bright light hung from the bow of a small boat poled along the shallow flats in the sounds. It affords fine sport, especially for mosquitos. A 25-gallon drum of repellent should get you through the night, however. You know what mosquito repellent is, don't you? It's a theory.

June 1991
Volume 55, Number 6

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WILDLIFE IN NORTH CAROLINA

Wildlife in North Carolina is the official educational publication of the North Carolina Wildlife Resources Commission, and is dedicated to the sound conservation of the State's wildlife and other interrelated natural resources and the environment we share with them.

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Wildlife Through the Year *by Vic Venters*

Cover *These hooded pitcher plants, growing in the wetlands of Brunswick County, are among the many uncommon plants that face an uncertain future.*

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The flounder's flattened *shape adapts it for a life spent at the bottoms of estuaries and tidal creeks. This predatory fish hunts by covering itself in sand and ambushing its prey, usually small fish like menhaden or mullet.*

Pigment-bearing cells *on the upper portion of the flounder's body enable the fish to camouflage itself to match an astonishing number of different surroundings. Based on photographs, these illustrations show that the flounder does a pretty good job of simulating environments of gravel (a), detritus (b), shell fragments (c) and coarse sand (d).*

The Excellence of Flounders

written by Lawrence S. Earley/illustrated by David Williams

The hatchling flounder *swims upright and its eyes are on opposite sides of its head, like most fish. Within a few weeks, the right eye begins to move to the left side of its head and its body begins to list leftward. Eventually it swims sideways and lies on the bottom.*

In the brackish waters of tidal creeks at this time of year dwells one of the most common of our coastal fish, and also one of the most curious. Flounders are justly famous for their delectable flesh, especially after they've been stuffed with crab meat and dredged in butter. But alive, the fish is also celebrated for an adventurous life history that encompasses a radical change of form and a couple of extraordinary adaptations.

You don't need special powers of observation to notice that both of the flounder's eyes are on the same side — the left side — of its head. (There are also rightsided flounder species, and some members of one curious species are rightsided while others are leftsided.) More astonishing, however, is the fact that the flounder isn't hatched looking like that. Indeed, for a while the young flounder looks like any other fish — it swims upright and its eyes are on opposite sides of its head. But beginning about the fifth week, the right eye begins to change position, actually migrating across the face until in a few days it lies next to the left eye. At the same time, the little flounder's body gradually leans to one side until eventually it begins to swim sideways.

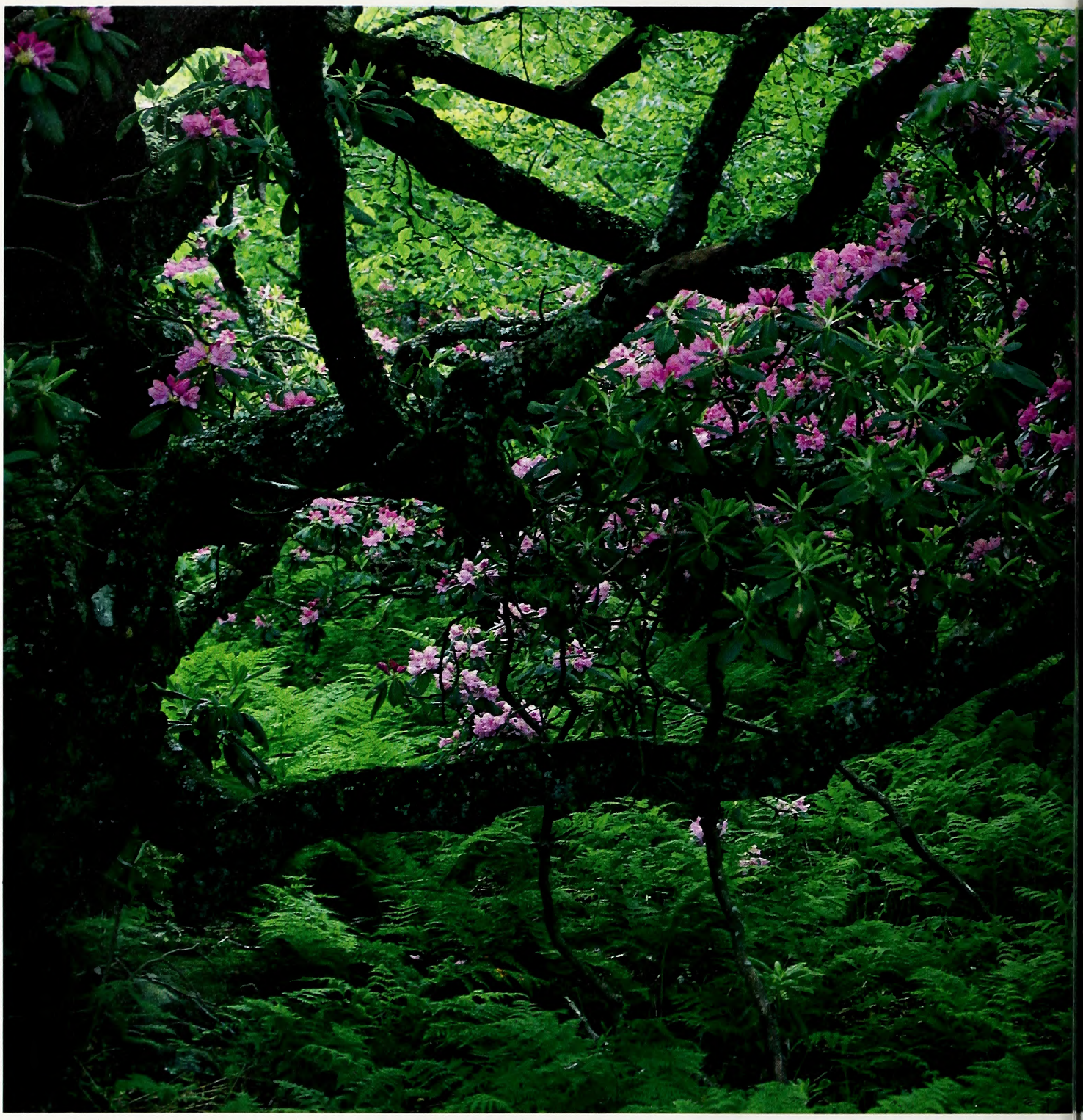
Henceforth, the flounder will confine itself to estuary and ocean bottoms where its flattened shape is a marvelous adaptation for safety and hunting. The flounder is a predator, but it's not a swift hunter like mackerel and other marine fish. Instead, it lies on the bottom covered in sand with only its eyes protruding, swiveling like tiny turrets. When a menhaden or herring, a shrimp or a crab passes, the flounder darts out to grab a meal. By remaining hidden much of the time, it can hunt from ambush and also reduce the odds of being eaten.

Aiding its life on the bottom is another adaptation, the flounder's ability to change its color like a chameleon to blend in with its surroundings. A flounder is white underneath, but its top side is covered with pigment-bearing cells. The pigment can change color and shape — from a dot to an irregular-sized blotch — almost instantaneously, creating a variety of colors and patterns that make the fish practically indistinguishable from its surroundings. Enterprising scientists have tested flounders against a variety of backgrounds, including a checkerboard pattern, and have been astonished at how well the flounder succeeds in camouflaging itself. This ability stems from the flounder's remarkable color vision — a blindfolded flounder doesn't change color at all. Instinctively, the fish scans its surroundings, its brain adjusting the pigment cells to suggest a sensational variety of colors or patterns.

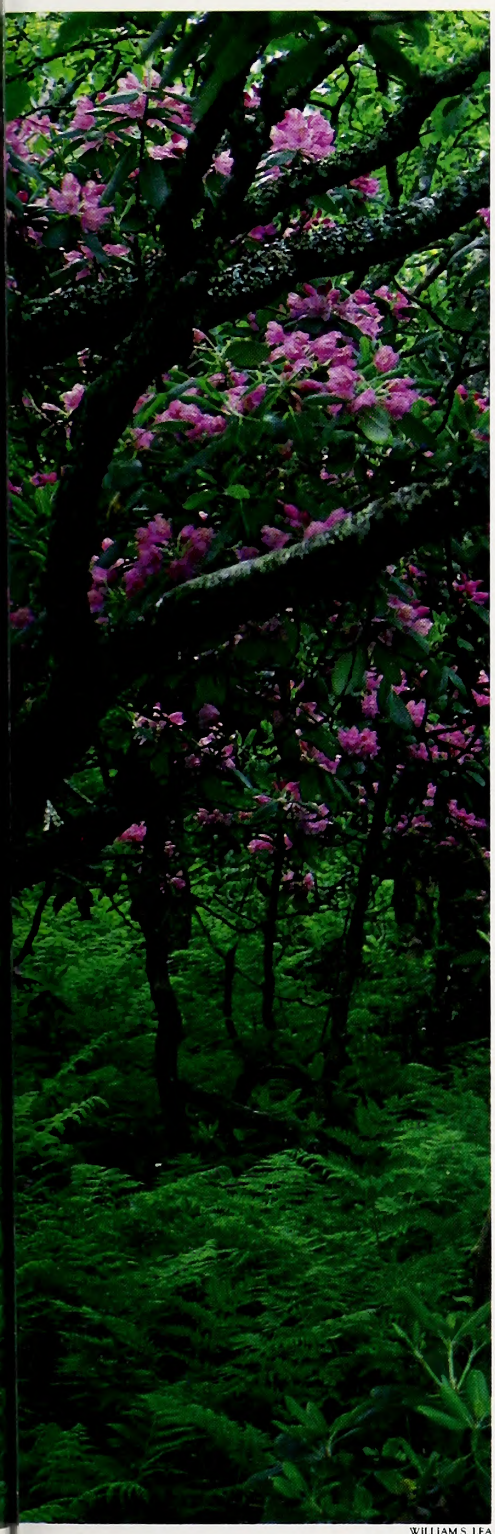
Three kinds of flounders frequent our coast, although the summer flounder is more common than either the southern flounder or the Gulf flounder. They are among 600 marine species worldwide that fall into the category of flatfish. Some flatfish are flattened from top to bottom, like skates or rays; other are flattened from side to side, like flounders.

About this time of year, flounders are found in the salt marshes fringing estuaries and behind the barrier islands. As the weather grows colder, however, they move into deeper waters offshore where they spawn in the fall and winter months. Currents and winds eventually move the small fish into the nursery areas in estuaries where they feed and grow, sometimes to surprising sizes — 30-pound flounders have been reported.

For all their excellence at concealing themselves, flounders often have fallen for an angler's bait, and their mistake is our good fortune.



Wildwood Flowers



WILLIAM S. LEA

The hills and hollows are ablaze with the blooms of rhododendron, but what do you really know about this familiar mountain plant?

by Doug Elliott

My mountaineer buddy Theron and I were on the side of a mountain one day, climbing through a laurel thicket. It was rough going. It was so steep that the trunks of the laurels were almost horizontal as they grew out toward the light. We had to use our hands as much as our feet to clamber up the slope. Everywhere we looked we were surrounded by a thick growth of thin, twisted trunks and forked branches covered with reddish, scaly bark. Above us was a low, thick canopy of leathery, green leaves.

I realize that I had better stop right here and clarify exactly what species of plant I'm talking about when I say "laurel." You can get as tangled up figuring out the proper names of these plants as you will in the densest thicket of them.

Depending on local custom and where you're from, the name "laurel" can refer to different plants. When southern Appalachian mountain folk talk about those "mountain laurels" we were crawling through, they usually mean the big-leafed rhododendron, *Rhododendron maximum*. However, to most Northerners and people who learned wild plants from books the name "mountain laurel" refers to *Kalmia latifolia*, a completely different plant also found in North Carolina that mountain folks call "ivy." One elderly mountain woman I know actually calls it "poison ivy."

When I asked her how it got that name, she said, "Cause it's poison. It'll kill sheep and goats if they eat it."

I remembered that "sheep kill" and "lamb kill" are names for a related species, *Kalmia angustifolia* that is found in acid woodlands and boggy areas around the state.

"If you call this poison ivy," I asked, "what do you call that three-leafed vine that gives you the itch?"

"That's poison vine," she explained patiently.

I realized that, as strange as it seemed, her folk name "poison ivy" is just as fitting as the more accepted and proper book name "mountain laurel." This shrub is certainly not in the laurel family nor is it found only in the mountains. Also, it's not an ivy, but it is poisonous to people and some animals (although the leaves and young stems are an important winter food for grouse). Indeed both the rhododendron and *Kalmia* are in the heath family (*Ericaceae*). I guess it's just this kind of confusion that makes botanists insist on using scientific names.

Call 'em what you will, however, we have three species of evergreen, leathery-leafed rhododendrons in North Carolina. They are most widespread in the mountains. The largest is *Rhododendron maximum*, often called "rosebay." It has large clusters of delicate white or pale pink flowers and leaves sometimes more than a foot long. The smaller *Rhododendron carolinianum* has leaves (usually less than 5 inches) and a smaller cluster of white to pink flowers that usually bloom between April and May. This, by the way, is the plant known as "punctatum" to mountain folks in the shrubbery trade and as *Rhododen-*

***Growing deep in a** mountain forest, the flowers of a* Rhododendron catawbiense *(left) seem almost to glow. This rhododendron is often called "purple laurel," but it is not actually a laurel. The bloom of the largest rhododendron,* Rhododendron maximum, *is a white cluster with delicate shades of pink (below). Often called "rosebay," it has leaves that may grow more than a foot long.*

WILLIAM S. LEA

WILLIAM S. LEA

The rhododendron *most commonly seen blooming in colorful profusion in May and June on mountain balds is* Rhodendron catawbiense. *This scene was photographed at Craggy Gardens. Roan Mountain is another favorite stop for rhododendron lovers.*

dron minus to botanists. The most colorful is the *Rhododendron catawbiense*, often called "purple laurel." This species is found above 3,000 feet in the higher mountains and its bloom is what makes such places as Craggy Gardens and Roan Mountain so spectacular in May and June.

To further complicate matters, there are nine species of deciduous-leafed azaleas that are also classified in the genus *Rhododendron*, but we'll save those for another time.

So, meanwhile, back in the laurel thicket, I was getting tuckered out trying to keep up with Theron as he slithered through that incredible tangle. I was about to suggest a rest stop when Theron pulled out his pocket knife and asked, "Did I ever show you how to make a crow call out of one of these here laurel branches?"

I was all ears and eyes (and mighty glad for a chance to catch my breath). Theron cut a branch about ½ inch in diameter and about 6 or 8 inches long. He very carefully split the stick down about half its length, then inserted one of the leaves into the split and trimmed the edges even with the stick. This way it would serve as a reed for the instrument. When Theron blew across it, the distinctive, high-pitched caw of a crow burst forth.

"It works good in the summer," he told me. "That fine, high-pitched call sounds like a young crow."

Since that time I have made some of these crow calls on various occasions, and it's a great way to pass the time when hanging out in laurel thickets. Sometimes the calls actually work. Once, I was standing in a small clearing in the woods surrounded by rhododendrons, and I had just made a call. I blew it a couple of times to try it out. Suddenly, just above my head and behind me, I heard the "whup, whup, whup" of frantic wing beats. I whirled around in time to see a totally startled crow that had swooped down to investigate my strange cawing noises and suddenly found itself about to land right on top of a dreaded human. That was one baffled bird as it beat the air trying to brake and back pedal out of there.

When the crow got back above the trees, I blew a couple more blasts on the call. The crow was so confused that it came swooping back for another look as though it could not believe what it was hearing.

Another time when I was blowing a call, trying to lure some distant crows, I somehow managed to thoroughly offend a nearby chickadee. If flew down face to face with me, about 5 feet away, and bawled me out something fierce!

As Theron and I continued along through that thicket, we stopped at a spring at the head of a creek. Theron scooped some cool, clear water out of the spring for a drink and looked around at the thick growth of laurels surrounding us on all sides. "This'd be a good place for a feller to hide out and make him some liquor," he said with a mischievous grin.

Yes, there's been many a gallon of powerful corn or sugar whiskey run off in mountainside laurel "slicks" like this. But while the thick tangle of growth and the quiet gurgle of cool spring water running over mossy rocks can be a haven for moonshiners, it can be pure hell for lost hikers.

"The best way to get through the laurels," says veteran laurel thicket crawler, Clyde Hollifield, "is to keep low like a bear. Don't try to think your way down the mountain by looking ahead and trying to plan out a strategy of how you're gonna go. Just go to the next clear place."

"And if you think you might have to hike through laurels," Clyde warns, "whatever you do, don't wear a backpack. Carry your gear slung under you, something like a shoulder bag or a fanny pack turned to the front."

A serious danger for trail hikers, according to Hollifield, is "laurel thicket syndrome." Backpackers searching for a shortcut down the mountain sometimes get lured off into the middle of one of these thickets.

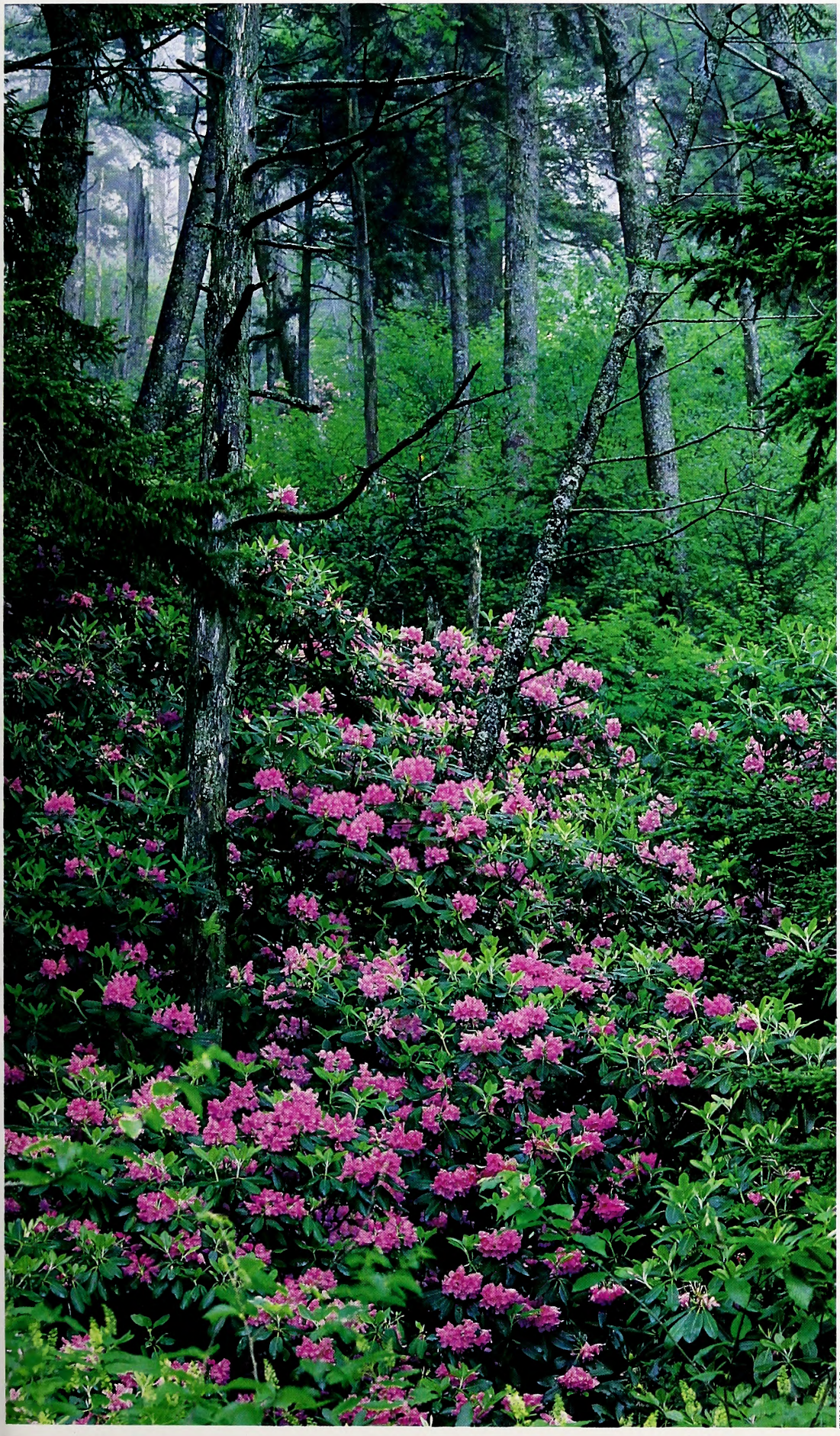
"Imagine climbing through the laurels with a full backpack for 4 or 5 hours when every step you take is thwarted by branches snagging your pack, ripping your clothing and clawing at your face; and you've tried to crawl under branches with your full backpack and your nose has plowed furrows through the dirt underfoot. Or you've tried to climb over branches and they suddenly give way when you put your weight on them. After a full afternoon of this, with evening coming on and rain threatening, and it's too steep and thick to pitch a tent, and the laurels still go on forever, a pecular type of madness sets in. I guess you'd call it some kind of dementia, and it's serious," he says solemnly (but with a twinkle in his eye). "People have died from it."

More seriously, University of North Carolina professor Elisha Mitchell fell to his death in 1857 on the side of the 6,684 foot mountain he measured that now bears his name. He was trying to cross the slick top of a water fall shrouded in mountain laurel.

While a laurel thicket can be the bane of hikers, it is often a boon for wildlife — especially big-game animals. Rhododendron leaves — unlike the toxic *Kalmia* — are an important food for deer in winter. It is often deep in these thickets where does drop their fawns and bucks shed their antlers. Bears also regularly spend the day and occasionally sleep for the winter in the shelter of a laurel thicket, and this is usually where they run when hounded by packs of hunting dogs.

Rhododenrons are the largest evergreen, broad-leafed plants in the mountains and their leaves are often the only greenery in the winter woods. Some mountain folks can tell the temperature within a few degrees by the condition of the rhododendron leaves. As the thermometer drops, the leaves begin to curl up lengthwise. The colder the temperature, the tighter they roll. When the temperature falls to 10 degrees Fahrenheit, the leaves will be rolled into tight tubes as thin as pencils.

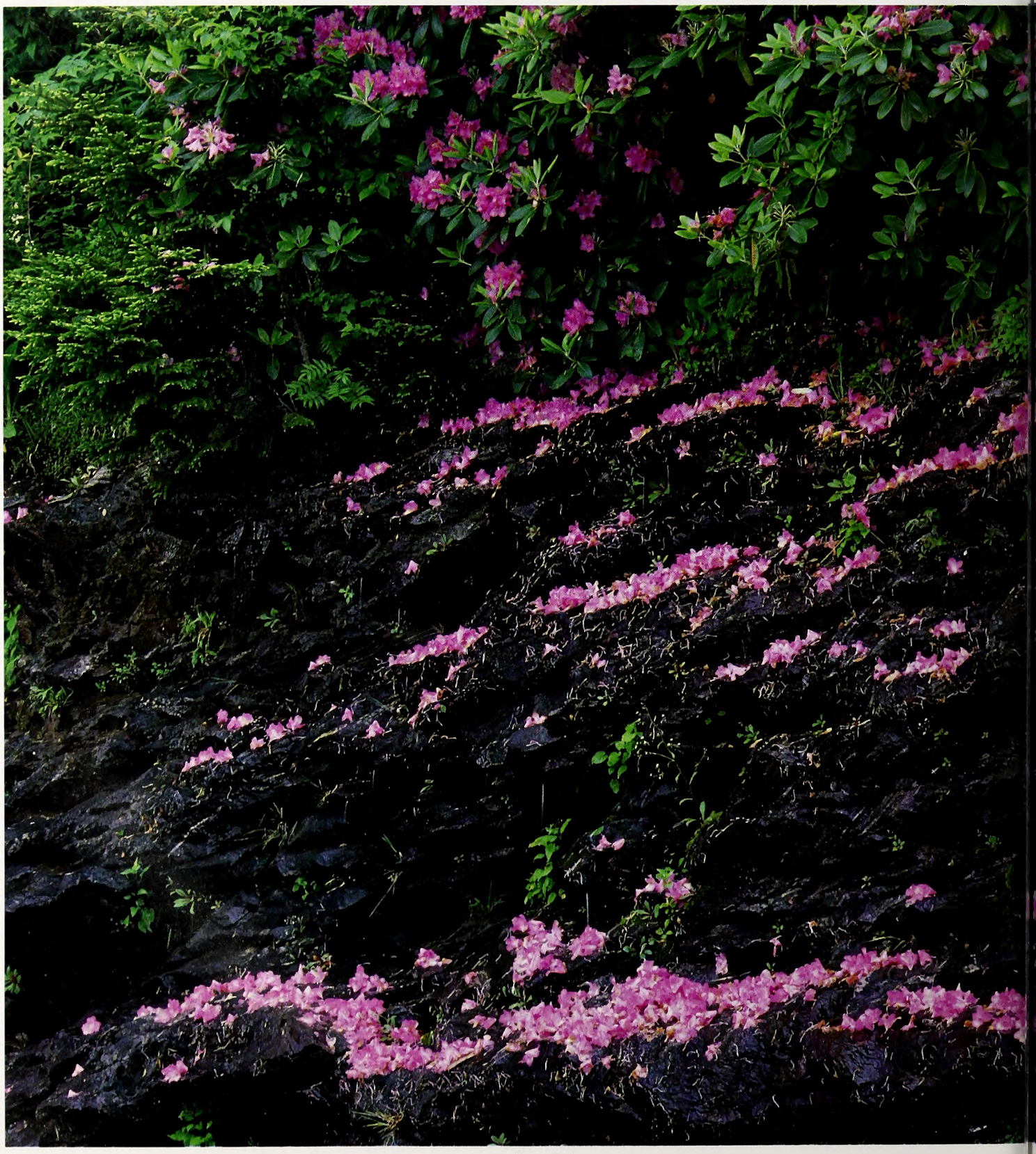
Both rhododendron and *Kalmia* have a reputation for producing poisonous honey;

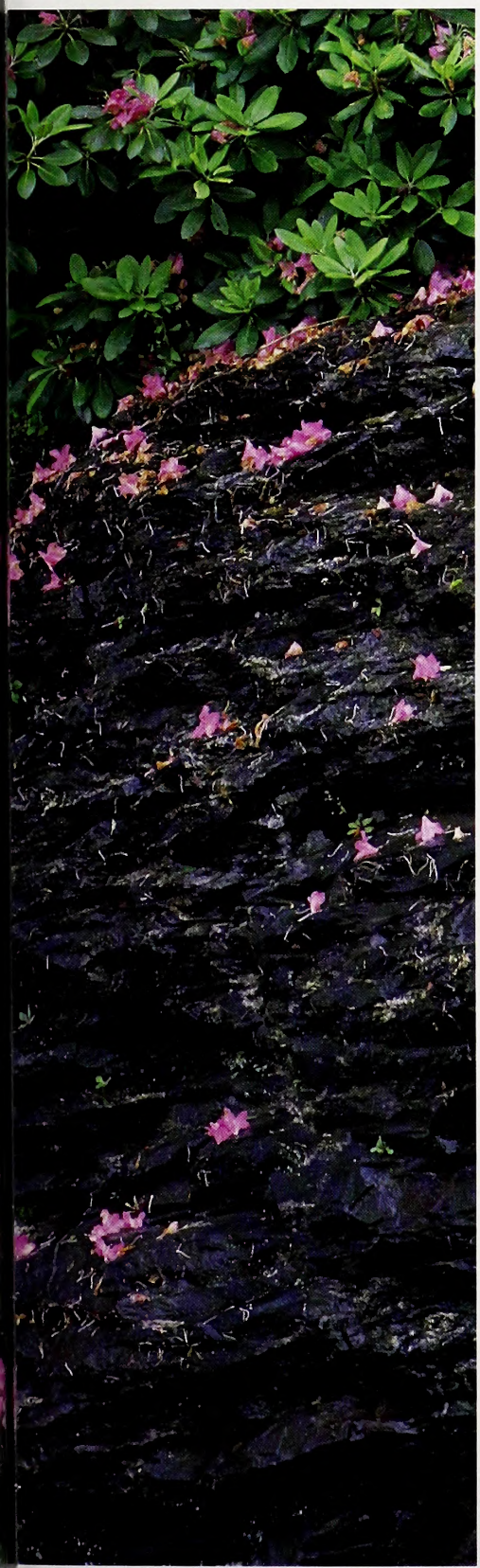


WILLIAM S. LEA

Rhododendron like this *colorful* catawbiense *and its kin, rosebay, frequently form extremely dense, virtually impenetrable thickets on mountainsides or along creeks, and some wildlife species, particularly bears, hide in them. In mountain slang, these rhododendron thickets are called "slicks" or "hells."*

***In a scene few artists** could duplicate, fallen petals of a* Rhododendron catawbiense *dapple a rocky outcrop. Botanists have hybridized rhodendrons to form many colorful varieties that are now planted in many parts of the country.*





WILLIAM S. LEA

MELISSA MCGAW

The strong, curved limbs *of rhododendron have long been used to make rustic furniture and other native crafts such as toys, letter openers, smoking pipes and carvings. During the early half of the century, rhododendron was also used to make tourist souvenirs that ranged from simple salt and pepper shakers and napkin rings to miniature whiskey stills and other familiar mountain symbols. Many of these souvenir items bear the wood-burned names of localities.*

however, the most recent report I could find comes from a Confederate army surgeon during the Civil War who witnessed a few toxic reactions. More than 2,000 years ago the Greek historian Xenophon wrote that Greek soldiers were poisoned by honey made from the flowers of a Eurasian species *Rhododendron ponticum*.

Modern beekeepers encounter little or no problem with this because our native rhododendrons yield little or no honey. Also, by the time *Kalmia* comes into bloom in May, the bees are usually busy harvesting tulip poplar nectar. Tulip poplar is the mountain bees' most abundant and dependable honey source, and when they are working it, they pay no attention to *Kalmia*. In some areas last year, however, there was a late freeze that killed the tulip poplar bloom and some beekeepers reported harvesting some very light-colored *Kalmia* honey early in the season. (The early flow of poplar honey is dark.) As attractive as the *Kalmia* honey looks, it is unmarketable because it has a bitter aftertaste. Therefore, it is usually left in the hive or fed back to the bees, and they seem to thrive on it.

Rhododendron and *Kalmia* have been important to the mountain people in another way. The rustic appearance and strength of the fine-grained wood make it an ideal material from which to construct a variety of items from children's toys such as "whimmy diddles" and slingshots to rustic furniture for the porches of country inns and souvenirs for the tourist trade. These novelty items have not only entertained many a mountain youngster, but have also provided cash income for backwoods families.

Of all the rhododendrons, the big-leaved "laurel" *Rhododendron maximum* is our most abundant. Even though it is not as showy as the pink-flowered Catawba rhododendron or as fragrant and delicate as the azaleas of spring, it is still my favorite. I like the fact that one plant can represent such extremes depending on your point of view — that it can be an "impenetrable hell" at the same time as it provides shelter, seclusion and safety, and all the while yields bouquets of heavenly blossoms.

Donald Culross Peattie described this plant aptly when he wrote, "At precisely that season when the shade grows dense and the breath of the valley is hot, when the thrush sings more and more briefly at dawn and after sunset, and all the other nine species of Rhododendron in the southern Appalachians have long since bloomed themselves out, the Big Rhododendron at last opens its great, cool blossoms from the immense buds... It is not gaudy or showy (but)... for refinement of detail, in form and color, it would be difficult to discover a lovelier flower in the American flora."

One sultry day this summer I hope you have a chance to retreat into some shady mountain "holler" and take a dip in the gravel-bottomed pool of a bubbling mountain stream festooned with rhododendron blossoms. When you do, you'll know you're in paradise. ⊡

RICE RIVER BASS

Those antebellum rice ditches along the lower Cape Fear River hold more than memories. They're the key to some good bass fishing when the tide is right.

by Vic Venters

A couple of times every day, a lunar tide fills the cypress-lined swampy ground bordering the lower Cape Fear River. Tannin-stained water sweeps into the marsh, filling the gullet of long-abandoned rice plantations. Then, as inexorably as the setting sun, the water retreats through a maze of 200-year old rice ditches, spewing water brown and turbid into the yawing throat of the big river and its twisting creeks. Detritus-rich, the falling tide carries with it the stuff of life—minnows, eels, crawfish, fiddler crabs—food for bigger game. At the ditch mouths, where slaves once toiled, largemouth bass now lurk in ambush for an easy meal.

We cast to them, Mike Lanier and I, and Mike quickly takes three small bass on a Bang-O-Lure at the mouth of an old ditch. For Mike, a young bass pro from Winnabow, the Cape Fear is "home water." He carefully releases each fish, then casts again, rapidly and accurately. Nothing hits now. The creek is quiet, silence broken only by the soft *ka-plop* of our lures splashing down and the muted hum of an electric motor. The spring air reeks of swamp mud and the ghosts of history.

Mike fires up his bass boat's big motor, and we rumble up the creek a quarter mile or so to the mouth of another rice ditch. In a repeat performance, we're soon catching more bass—small ones mostly, but scrappy fighters toughened by the Cape Fear's uncompromising tidal habitat. I get lucky and land a 3½-pounder on a spinnerbait beside a deadfall near the creek channel. A solid catch for this river and it's returned to fight another day. In 15 minutes, we're off again up the creek to another ditch and more bass. It's a fishing pattern that we'll repeat all day.

"Run and gun" tactics like this aren't limited to the lower Cape Fear, but the method reaches a state of perfection on this river. Moving and fishing with the falling tide is the first of two keys to catching fish on the Cape Fear. Unlike the bulk of North Carolina's major coastal rivers, the Cape Fear spills her reddish-brown water directly into the Atlantic Ocean. With no protective sounds like Albemarle, Pamlico and Currituck to buffer it from the tidal effects, the water rises and falls an average of 4 or 5 feet in the river basin each day. Moving water means migrating bass, and the fluctuating levels can turn a hotspot into a barren location in a matter of minutes.

KEN TAYLOR

***Mike Lanier** (left) prepares to boat a bass he hooked at the mouth of a rice ditch on the Cape Fear. On a falling tide, bass gang up at ditch and creek mouths to ambush baitfish and other prey. Remains of the old rice ditches criss-cross much of the marsh bordering the lower Cape Fear and her tributary streams in the Wilmington and Brunswick County area (right).*

RICE RIVER BASS

The key to success is finding the bass, of course, and fishing to them at the right time with the right method. In the spring and summer, that "right" place is usually at the mouths of rice ditches and the small feeder creeks that drain into the main river or into the Cape Fear's larger tributary creeks. Although there's good fishing up the length of the Cape Fear River and her tributaries well into the Piedmont, the tactics I'm describing are best suited to the former rice-growing region around Wilmington.

For fishing purposes, the rice region begins 10 miles or so below Wilmington on the main river and extends up to about the Castle Hayne area on the Northeast Cape Fear, about 16 miles above Wilmington. Over 200 years ago, large plantations flourished along these portions of the Cape Fear and Northeast Cape Fear rivers. With slave labor, the marshes along the river were ditched, dammed and diked so the fields could be planted with rice, then flooded or drained at will. The network of ditches was extensive; in 1860, for example, it was estimated that 90 percent of the rice grown in North Carolina came from the lower Cape Fear. The Civil War changed all that, and by the early 20th century, only the abandoned ditches remained.

Though the ditches no longer fulfill their original purposes, bass have learned to use them as a series of underwater cafeteria lines. When the tide falls and drains the marshes, the small feeder creeks and rice ditches channel baitfish and other food into the reach of hungry bass that concentrate at the mouths of the ditches. While there're plenty of bass in the river, to catch them you have to leave some of your old fishing conceptions back at the reservoirs and non-tidal rivers.

"If you want to be successful here, you've *got* to pay attention to the tide," Mike emphasizes. "When fishing ditch mouths, you'll always want to be fishing falling water." The tide in the Cape Fear falls for about seven hours, but Lanier says the last four to five hours of the falling tide are the best. "I generally like for the tide to have fallen out a couple of hours," he explained. "I'll fish these ditch mouths as long as the water is moving out. When the water stops, I'll move upstream where the tide is still falling."

If you've got a fast enough boat, the best strategy for fishing the tide usually means running down the river to where the falling tide is on its last legs. After fishing there until low tide, you can run back upriver to where the tide is still falling. Then repeat the process, hopping up the river from creek to creek, ditch to ditch. "For every eight river miles, there's about an hour's difference in tide," Lanier adds. "So if it's low tide in Wilmington at 12 o'clock, then eight miles up it will be low tide at one o'clock."

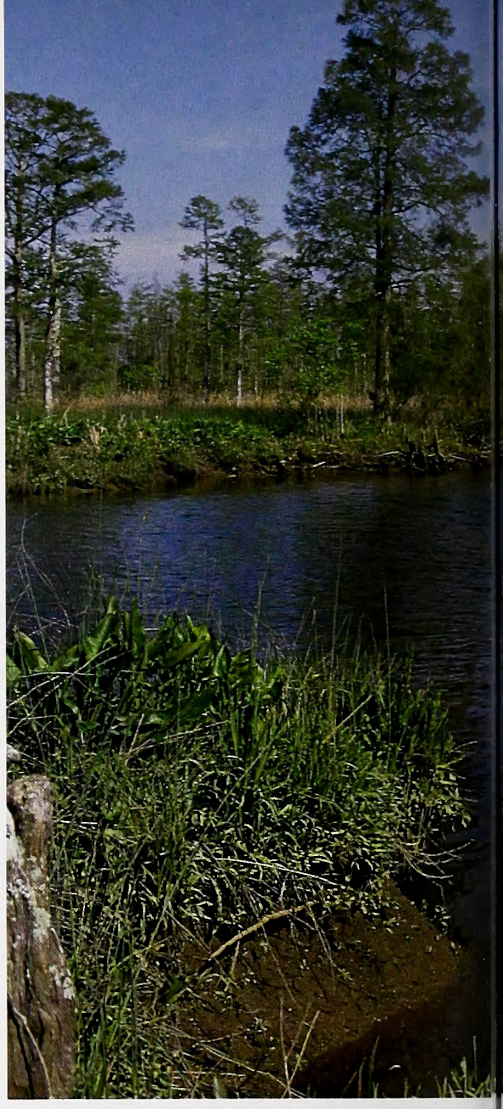
Here's the catch. Some rice ditches hold fish, others don't. To the newcomer, determining which creek will pay off and which will bust can be like a crapshoot. "A lot of fishermen who aren't used to this sort of thing get intimidated when they come down here and can't find the bass where they think they ought to be," Mike says. "Almost all of the creeks and ditches hold some fish. But some are a lot better than others."

"The best way to learn is through experience," he advises. "If you haven't spent a lot of time on the river, one tip is to look for ditches that have water standing in them even after the tide has fallen completely out. These are often more productive. Also, look for creeks that have some deep water—8- to 10-foot dropoffs—near their mouths. If you find feeder creeks or ditches that have both these characteristics, you probably have a fishy place."

For bass fishing the Cape Fear, you won't need as many types of lures as you might on a Piedmont reservoir. What you *must* do to catch tidewater bass, however, is fish those lures properly. Lures should *always* be fished so that they are retrieved coming back to you with the flowing current. Baitfish or other food will be swept from the ditch mouths down with the current, and lures coming in this direction look most natural to the bass. During the spring and early summer rainy season, the river gets muddy, so bright, fluorescent colored lures work well.

Mike's favorite river plugs include shallow-running crankbaits in chartreuse or fire-tiger colors, and 5-inch Bagley Bang-O-Lures in gold and black. Chartreuse or shiner-colored Zara Spooks are good for fall top-water action. With spinnerbaits, he likes ¼-ounce gold-bladed chartreuse and blue patterns in cool water and larger sizes when the water warms. The plastic worm, as expected, is a deadly bait and probably imitates the eels found in the river. Red-shad, black and other dark colors seem to work best. For casting, 6-inch worms are good and Mike advises fairly light weights for them, ⅛-ounce or so. For pitching, use a bigger worm and up to ¼-ounce weights. In June, buzz-baits come into their own. Chartreuse and white buzz-baits work well when fished around grassbeds and lily pads.

Proper boat positioning is important too. "This water runs pretty strong, so you also should fish with your boat pointed into the current and running against the tide," Mike says. "If you're drifting down with the current, you're not going to be able to make enough casts into the mouth. One cast and you've zipped on by. You won't catch many fish that way."



Fishing the falling *tide correctly is the key to catching bass on tidal rivers. The many creeks on the lower Cape Fear (above) usually offer anglers better fishing than the main river. When the tide begins to rise, bass spread out and are harder to catch, although they can be taken by fishing marsh grass banks and lily pads (below).*

Obviously you need a reasonably powerful electric motor and a well-charged battery to do this over the course of a day. If you don't have these, bring a good anchor instead. That way, you can run up past the ditch mouth, drift back, then drop anchor as the boat comes abreast of the ditch.

Although generally not as productive, fish can be caught on a rising tide, but it demands a change in tactics. "The fish generally turn off at the ditch or creek mouths when the tide turns," Lanier explains. "So I switch to fishing

VIC VENTERS

EUGENE HESTER

the marsh grass and lily pads." Both branches of the Cape Fear have extensive marsh banks, so finding them won't be a problem. "The best marsh banks are the ones located where the water can't flood in behind them," Lanier advises. "The fish don't get so spread out back in the marsh. June is also the best time to fish buzz-baits in the marsh banks and lily pads."

Another factor to contend with is the moving salt line. When the rains decrease in mid-to-late summer, brackish, salty water from the ocean pushes well up the river, even as far north as Wilmington. When this happens, the bass migrate ahead of the saltiest water. Consequently, you should fish farther up tributary creeks or up the river.

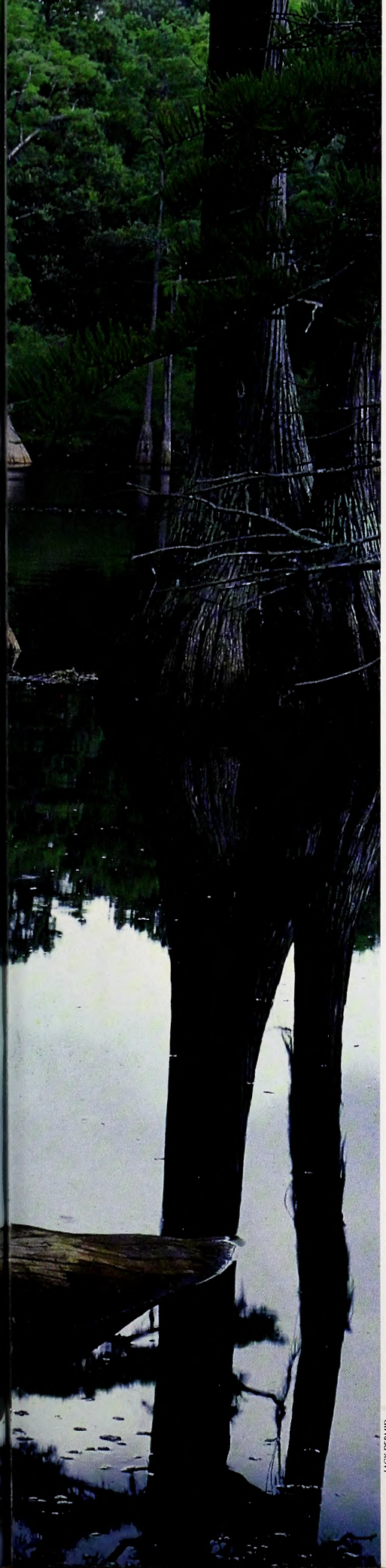
The Cape Fear isn't known for large bass, but river fish are extra-tough fighters, conditioned by currents. An average Cape Fear bass runs about 1 pound. A 5- or 6-pounder is a fish to be proud of and anything bigger is a real lunker.

Research conducted by N.C. Wildlife Resources Commission biologists confirms that bass in the Cape Fear have considerably slower growth rates than bass in other coastal rivers. For instance, it takes an astonishing five years for a bass to reach 12 inches (legal harvestable size) in the Cape Fear. This is the slowest bass growth rate found in the coastal North Carolina rivers surveyed, and it's downright pokey when compared to growth rates found in many reservoirs. In Lake Sinclair in Georgia, for instance, bass reach 12 inches in only two years. There are also fewer bass in the Cape Fear than in some coastal rivers.

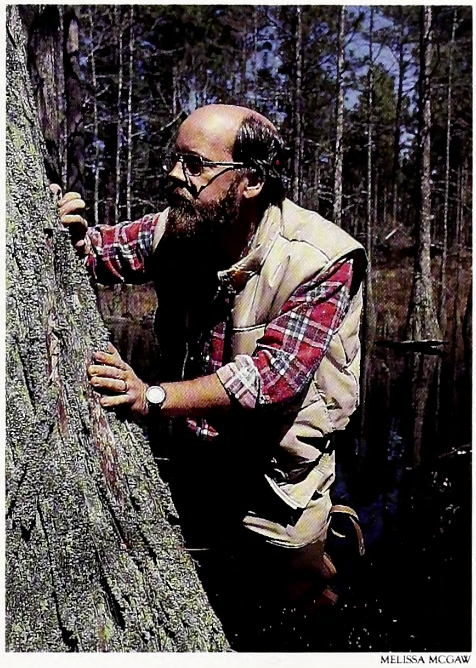
There are probably several reasons for this. The Cape Fear's water is relatively acidic, limiting fertility. Spawning fish must also contend with the vicissitudes of a 4-foot tide. Constantly changing water levels eliminate a lot of prime spawning habitat. River bass have plenty of predators to look out for, too, and I don't necessarily mean those driving bass boats. The biggest fish I've ever taken from the Cape Fear — a 4½-pounder — bore a long-healed but large U-shaped bite mark on its side, that fish's permanent reminder of its harsh life among gar, alligators and other toothy river denizens.

All these factors combined mean that anglers ought to consider tossing back a good portion of their catch. "I'm big on catch and release," Lanier said. "These fish have a tough life in this river so I release all the fish I catch."

All things considered, the lower Cape Fear doesn't offer the state's best fishing in terms of large bass or numbers of fish caught. If that's what you are seeking, there are better waters for you. On the other hand, if you like cypress trees and history, moving water and marsh grass, the Cape Fear is the place to be. That's certainly where you'll find us. ☒



JACK DERMID



MELISSA MCGAW

Stew in BRUNSWICK

No county has more rare plants, animals and natural communities than Brunswick, but can these resources survive the county's unprecedented growth and development?

by Lawrence S. Earley

Military Ocean Terminal, Sunny Point. We move through checkpoints surrounded by concrete bunkers and guarded by nervous young GIs with holstered firearms. "You need to leave your cameras and your cigarette lighters with me, sir," says a jittery soldier. We explain that we're with the two fellas in the car waiting ahead, one of whom is in charge of the base's natural areas, that we have no cigarette lighters, but that we most surely need our cameras. Flustered—they didn't explain that this post could be so complicated—the GI waves us on.

That's the way it is here at Sunny Point just a few weeks after hostilities ceased in the Persian Gulf. Things are slowing down now. The 12-hour-a-day, 7-day shifts loading pallets of 1,000-pound bombs for the F-16s are over, but there's still an air of anxious endeavor.

But we're not here to see this U.S. Army base on the lower Cape Fear River in Brunswick County in the aftermath of the Persian Gulf conflict. We're here to see the base's curious limesink ponds that were formed—a thousand years ago, 50 years ago or even more recently—when a layer of limestone many feet below the surface suddenly collapsed causing a water-filled depression that hosts, in many cases, a suite of 20 or 30 rare aquatic plants. Two of the most interesting are pondspice (*Litsea aestivalis*), an attractive and fragrant shrub in the bay family and a candidate for federal listing as an endangered or threatened species, and dwarf bladderwort (*Utricularia olivacea*) with white flowers so tiny that, as one botanist put it, they look like a handful of grits on the surface

***Hundreds of lime** sink ponds often fringed by pond cypress (left) dot the Brunswick County landscape. An unusual natural community, the ponds host a suite of rare plants and animals. Biologist Bill Adams (above) looks for rare mollusks in a pond at the Military Ocean Terminal at Sunny Point.*

HAL HORWITZ

JACK DERMID

***Brunswick's landscape** is marked by a diversity of wetland and upland habitats. One of the rarer wetland plants in the county is the golden crest* (Lophiola americana), *left, a state endangered species. The broadhead skink (above) is a relatively common reptile that is adapted to drier woodland habitats.*

of the water. The ponds (most are less than an acre in size) are most numerous—200 or more—in Brunswick County, with 86 of the most interesting ones here at Sunny Point.

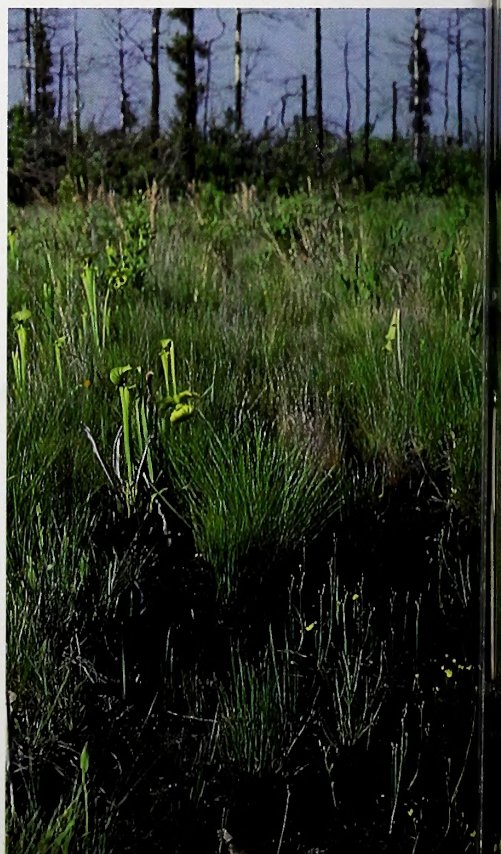
More important, we're also here to consider the ponds as a part for the whole, the whole being Brunswick County and its cornucopia of natural curiosities. Here to consider how or even whether this natural bounty will survive the frenzied growth that has thickened so many of the county's roads, riverfronts and beaches with new waterfront homes and golf courses, much of it in the last 10 years. Long a mecca for naturalists, the county is fast becoming a destination for retirees and a host of south-seeking migrants looking for a 9 a.m. tee-off.

We move from pond to pond. One is fringed with pond cypress, one lacks the cypress but unfurls a stand of grasses to the March breezes. And here's one with a dozen great blue herons that wheel in consternation above their nests, croaking like trolls. An anhinga rookery last year, now the pond serves the great blues. No checkpoints; no IDs. Just a quiet transfer of tenant rights. (Or did we just miss the avian brouhaha?)

Is there anything about Brunswick County that's ordinary? The county brims with singular natural attractions, stuck in seemingly inconsequential nooks and crannies like the freshwater ponds on the mainland side of Sunset Beach. That's where the wood storks congregate each year. Wood storks? They're fairly common in Florida, but you won't find them anywhere else in our state. Another animal more at home in Florida, a manatee, was washed up on a spoil island in the mouth of the Cape Fear River in 1986, a year before a shortnose sturgeon was hauled out of the Brunswick River. The fisherman was no more surprised than state biologists—it's the only place in North Carolina where that endangered sturgeon is considered to have a self-sustaining population. And consider the status of a tiny mollusk with a big name—the magnificent ramshorn. Bill Adams, a U.S. Army Corps of Engineers biologist, found it in Orton Pond in 1986, just north of Sunny Point. Formerly found in Greenfield Lake in Wilmington, this snail is now unique to Brunswick County, unique to the state, and unique, it would seem, to the planet. On Bald Head Island grows the sabal palmetto, so common in our neighbor state to the south, but occurring only here in the old north state.

On the other side of the county, the Plymouth gentian (*Sabatia kennedyana*), appears along the Waccamaw River. Neighboring Horry County in South Carolina has a small population, and after that? Cape Cod and Nova Scotia, don't you know. In Juniper Creek, an acidic tributary stream of the Waccamaw River, lives the Carolina pygmy sunfish, found only here and in a single site in South Carolina.

Compared to this gaudy crew, the insect-eating marvel, the Venus flytrap (*Dionaea muscipula*), is a mere carnival act. Its center of greatest world-wide abundance is Brunswick



County, one of six plants found more plentifully here than in any other North Carolina county, while another half dozen are found nowhere else in North Carolina. The county runs, crawls and slithers with a copious collection of rare and endangered wildlife — alligators, peregrine falcons, bald eagles, ridley, green and loggerhead sea turtles, piping plovers, red-cockaded woodpeckers, crawfish frogs, Bachman's sparrows, brown pelicans, glossy ibises and black bears.

"Brunswick County has, by far, more records of rare plants, animals and significant natural communities than any other county in the state," says Alan Weakley of the state's Natural Heritage Program. "It's a center of distribution and endemism for so many species that it's extraordinary." Under the Heritage Program's method of accounting, Brunswick County is a celebrity.

- More than 500 "natural heritage elements," or populations of rare plants and animals and high-quality natural communities. That's more than any other county in the state. Only three other counties have more than 300 of these elements of natural diversity.
- The only coastal county with more than 100 rare plant records.
- The only county with more than 20 natural areas of national and statewide significance. (See "Brunswick's Dazzling Diversity," p. 18.)

And the reason for all this is an extraordinary diversity that comes partly, but not totally, from its geographical position at the southernmost tip of the state. Brunswick County is bounded on its southern edge by the Atlantic Ocean, on its eastern and northern edge by the Cape Fear River, on its western edge by the Waccamaw River, and by Horry County, South Carolina, on its southwestern edge. These boundaries create a superabundance of aquatic, wetland and upland habitats for many diverse species. Along its east-west trending barrier islands, maritime forests dominated by live oaks and yaupon once grew. Inland, several miles of estuarine marshes border the lower stretches of south-flowing blackwater rivers such as Lockwood Folly River and Shallotte River. The ridge and swale systems in the upland areas near the Intracoastal Waterway used to bristle with longleaf pine forests and quake with pocosins.

And positioned on the low-lying Coastal Plain, the county embraces almost the entire inventory of the state's wetland habitats. There's the Green Swamp and its associated longleaf pine savannas and pocosins. There are the limesink ponds in various spots around the county, and a complex of wetlands near Boiling Spring Lakes. In the Cape Fear River are extensive tidal marshes — saltwater marshes at its mouth and freshwater marshes near Wilmington. The Waccamaw River is a blackwater river with extensive bottomland swamps and stands of Atlantic white cedar; the Cape Fear is a brownwater river. There are oxbow lakes and 200-year-old millponds like Orton Pond.

HAL HORWITZ

Herbaceous bogs *(below) populated by hundreds of pitcher plants are another wetland type found in Brunswick County. Pitcher plants are among the many insectivorous plants found in the county, especially in the Green Swamp where at least 15 insect-eating plants have been discovered. The sundew* (Drosera filiformis) *and the horned bladderwort* (Utricularia cornuta)*, right, are two uncommon insect-eating plants.*

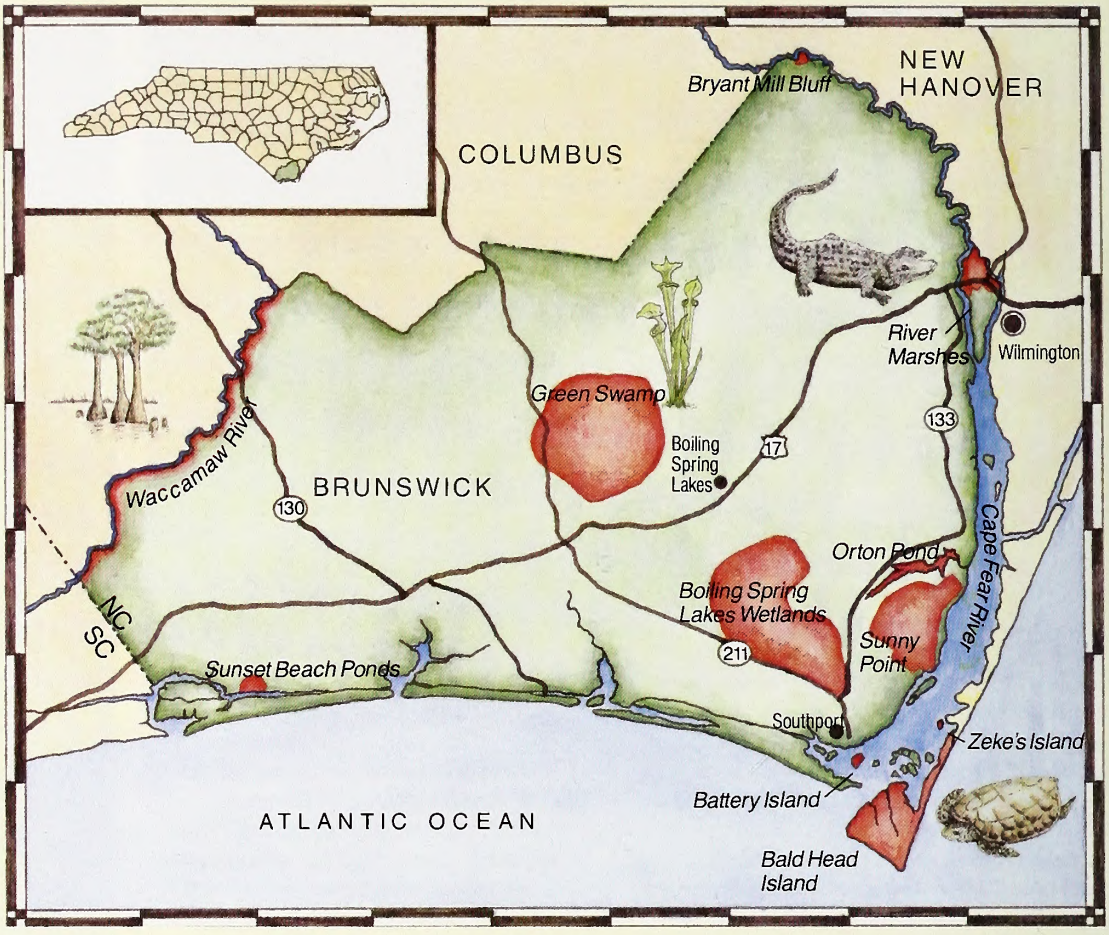
JACK DERMID

One of the only land forms it doesn't have is a mountain, but perhaps if it had, William Hilton might not have found the weather as much to his liking on the first English voyage of discovery up the Cape Fear River in 1662. The county's temperate climate had a lot to do with its role as one of the earliest areas in the state to be explored and settled, bestowing a rich cultural history on the county. Large plantations once lined the river, crowned by Orton Plantation featuring its famous gardens. Fort Caswell's Civil War redoubts lie at the end of Oak Island, while the ruins of Old Brunswick Town, the earliest settlement in the county, are located not far from another old city, Southport, with its lovely live oak-lined streets.

Back at Sunny Point, we move from pond

Brunswick's Dazzling Diversity

A sampler of outstanding natural areas, from barrier island to inland swamp, that distinguish Brunswick County.



Orton Pond
Millpond and surrounding uplands provide breeding habitat for anhinga, osprey, fox squirrels, alligators, red-cockaded woodpeckers and a rare snail *(Planorbella magnifica)*. The Natural Heritage Program rates this site as having national significance. *Restricted access.*

Boiling Spring Lakes Wetland Complex
The largest group of pocosins, Carolina bays and savannas in private ownership. Several rare plants have been found here, including the rough-leaf loosestrife. National significance. *Restricted access.*

Military Ocean Terminal Sunny Point
The 12,000-acre military base contains a large number of limesink ponds, longleaf pine forests and pocosins which provide habitats for many rare and endangered plant and animal species. National significance. *Restricted access.*

Waccamaw River Aquatic Habitat
The habitats associated with the Waccamaw River contain rare plants, including the disjunct Plymouth gentian, and several rare fish and shellfish. National significance.

Bald Head Island
Diversity of high-quality maritime communities, including the largest remaining maritime forest in the county. The island also hosts the state's only locations of cabbage palm *(Sabal palmetto)*. Large numbers of loggerhead sea turtles nest on the island's beaches. National significance.

Green Swamp Preserve
Owned by The Nature Conservancy, the 15,700-acre Green Swamp Preserve consists of an extensive pocosin wetland system associated with probably the best remaining longleaf pine savannas in the state. Provides unique habitats for 14 insectivorous plants and a variety of wildlife, including the black bear, American alligator and red-cockaded woodpecker. National significance. Call The Nature Conservancy for information about field trips. (919) 967-7007.

Battery Island
The maritime forests on this natural island in the lower Cape Fear River host the state's largest breeding colony of herons, egrets and ibises. More than 5,500 nests have been counted. National significance. *Restricted access.*

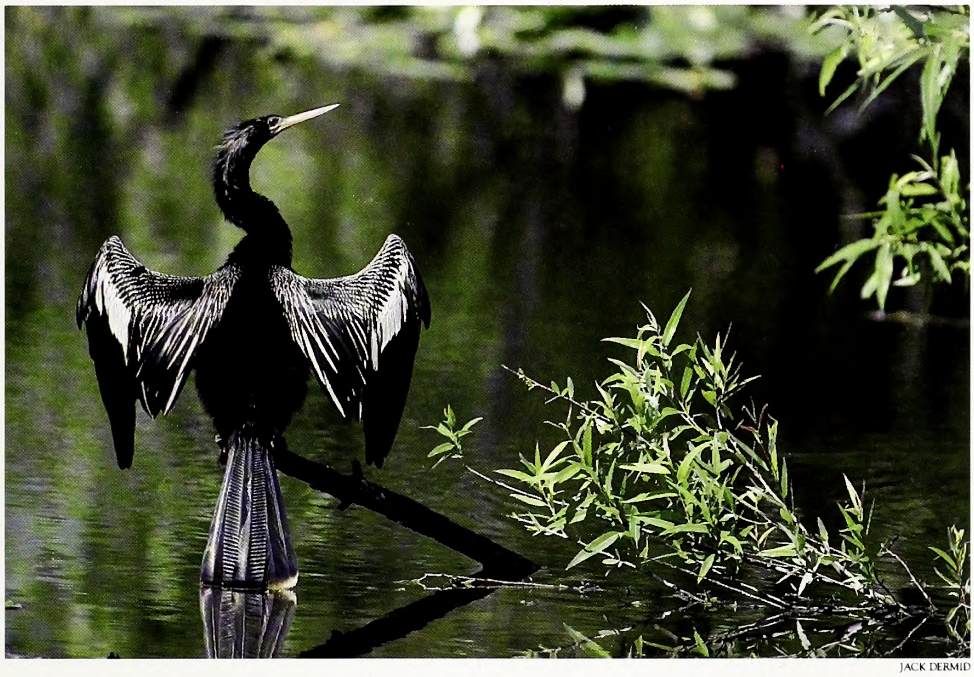
Brunswick/Cape Fear River Marshes
The extensive freshwater tidal marshes in this area support one of the largest populations of alligators of any North Carolina river or estuary. Statewide significance.

Sunset Beach Wood Stork Ponds
In late summer, these ponds are visited by post-breeding wood storks from Florida and Georgia. The ponds are the northernmost localities on the Atlantic coast used by wood storks. Statewide significance. *Restricted access.*

Bryant Mill (Greenbank) Bluff
Located along the southern shore of the Cape Fear River, this bluff contains a variety of wet and dry habitats sheltering several unusual plant species, including large-leaved grass-of-Parnassus. National significance. *Restricted access.*

Zeke's Island Estuarine Sanctuary
Complex of islands, marshes, tidal flats and shallow estuarine water on the northern end of Bald Head Island. An important nesting site for loggerhead sea turtles and colonial nesting waterbirds. Statewide significance. *Restricted access.*

Source: Natural Heritage Program
Note: Most sites are either privately owned or have extremely limited access.



JACK DERMID

Male anhinga suns itself *in a freshwater swamp in Brunswick County. Sometimes called the snake bird, the bird dives for fish. It extends its wings not so much to dry them out as to regulate its body temperature.*

to pond, chatting, admiring the surrounding longleaf pine flatwoods that are open and airy. This was the way most of Brunswick County was not too long ago — biologists say that most of the county was longleaf pine savanna — and we're able to catch a glimpse of the past here because Tony Gaw, Sunny Point's natural resource manager, keeps his woods in fine fettle with regular burning. "I burn what I can," he says with a laugh, "but with all that ordnance rolling around here all this winter, we couldn't burn and I'm a little behind schedule."

We're back at the last checkpoint, our ID cards removed. The wary young GIs wave us through, this time without a camera check.

We're off public land now, back in Brunswick County. Back to the future.

The Brunswick Bustle

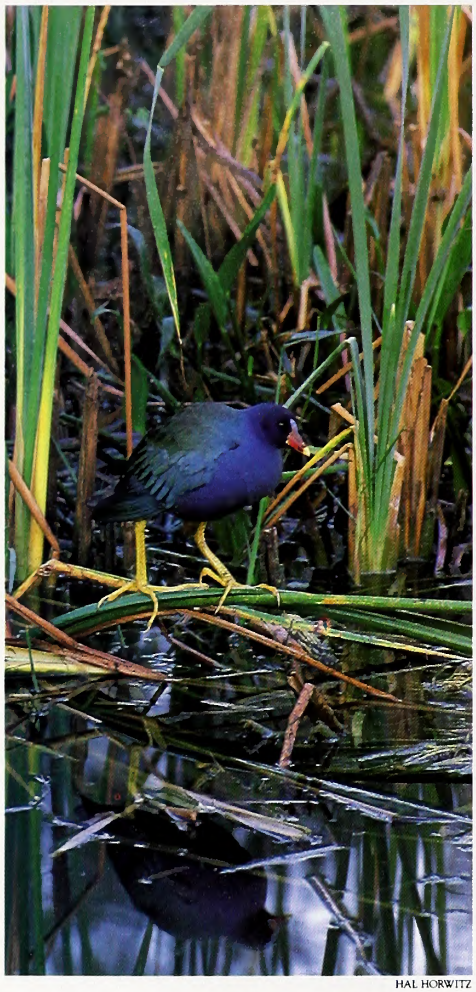
You can hear it on NC 133, on the outskirts of the base. You can hear it on US 17, hear it in the traffic around Shallotte, around Lockwood Folly, where the congestion gets worse each year. You can see it on Oak Island and other island communities, in the subdivisions and golf courses that weren't here five years ago. Tourist brochures tout the more than 100 golf courses within an hour's drive. It's a steady din of more and more: houses, marinas, golfers. But it's a din that threatens fewer fox squirrels, magnificent ramshorns, crawfish frogs. It's the Brunswick bustle.

Some experts predict that in the coming years, more than 75 percent of all Americans will live within 50 miles of an ocean or Great Lakes coast. It's as if the country were creased in the middle, with both halves tilted toward the coasts, people from Ohio and Minnesota sliding oceanward year by year. Brunswick County, like other coastal counties, has experienced a lot of that in-migration in the past 20 years, and most observers say that the completion of I-40 to Wilmington will hasten the process. State and county planners see Brunswick's growth as a natural spin-off from Wilmington's growth and the inexorable commercial march northward from Myrtle Beach, South Carolina, along US 17.

The county's population grew 42.5 percent from 1980 to 1990, next to Dare County the fastest-growing county in the state. (Although

Bald Head Island's *maritime forests include the cabbage palm* (Sabal palmetto)*, very common in South Carolina but found only on Bald Head Island in North Carolina. Geographically situated as it is, the island represents the northern limits of many species.*

JACK DERMID



HAL HORWITZ

***Gaudy in its** iridescent plumage, the purple gallinule makes its living in freshwater ponds. Brunswick County has extensive freshwater and saltwater habitats that are hospitable to large numbers of birds.*

this rate is high by any measure, it's actually less than the 48-percent growth it experienced from 1970 to 1980.) Like other coastal counties, Brunswick has enjoyed a high seasonal population, as vacationers sought the sun for a week at a time in rented beach cottages, but more and more people are opting to put down roots. The county's permanent population has more than doubled from 1970 to 1990, from 24,223 to 50,985, and in the next 20 years it is expected to double again. Many of these migrants are retirees, and the county expects the population to become progressively older in the coming years.

More important, however, is where these extra bodies are going. Not surprisingly, the attractive beach communities—Sunset Beach, Ocean Isle Beach, Holden Beach, Long Beach, Yaupon Beach, Caswell Beach and Bald Head Island—are among the fastest-growing areas of the state. A brochure promoting "The Brunswick Islands" summarizes their allure: "47 miles of clean beaches, history at every turn of the road, scenic beauty in abundance, water and land sports, and a slowed Down-East pace that soothes the spirit and body." Yet the county is growing even faster in inland areas just across the Intracoastal Waterway where the tidal creeks rapidly are being embellished with subdivisions and golf courses. As a result, during the 1980s the townships of Lockwood Folly and Shallotte grew the fastest of any area of the county.

"Growth is happening throughout the county, both east and west, north and south," says Haskell Rhett, coastal field representative with the Wilmington office of the Division of Coastal Management. "I'm not saying that there's no green space left, but if you ride through the county today thinking of what was there five or 10 years ago, you see some pretty dramatic changes."

The impacts of development on coastal ecosystems are by now too well-established to bear repeating in any detail. Brunswick's attractive barrier islands mostly have been scraped clean of maritime forests, but the habitats now under direct threat are the mainland maritime forests along the tidal creeks and ridges on the northern bank of the Intracoastal Waterway. This is where development has been heaviest in recent years, and it's in these areas that biologists are seeing characteristic symptoms of ecological decline.

- Biologist David Dumond of Wilmington speculates that increased drainage through ditches and shallow wells has caused some of the limesink ponds to dry out near Pretty Pond, in the Boiling Spring Lakes area.
- Bill Adams is worried that the magnificent ramshorn in Orton Pond, downstream from the golf course and subdivision at Boiling Spring Lakes, may not survive current land uses upstream. "People want a nice lawn, so they fertilize," he says, "and then the nutrients get into the ground water and eventually work their way to Orton Creek and they get into the pond." The nutrients have grown a thick carpet of weeds in the pond, interfering with boating use and prompting calls for weed eradication efforts which might harm the rare snail. It's the kind of problem that worsens with development.
- The N.C. Division of Environmental Management has reported that failing septic tanks and stormwater runoff from subdivisions along the Lockwood Folly River are the most likely causes of high counts of fecal coliform in the river which have closed shellfishing over widespread portions of the river. Shellfish in lower estuarine sections of Lockwood Folly River once supported a thriving fishery. But as the riverbanks were developed, rising amounts of bacteria were detected. By 1988, 71 percent of the shellfishing areas had to be closed, the largest percentage of closed shellfishing waters of any river in the state. Because of periodic high bacterial levels, the river was removed from a list of coastal waterways to be reclassified as Outstanding Resource Waters, although a management plan underway seeks to restore the river.

The county's official stance on the topic of growth is that it's inevitable and desirable. "The county commissioners have consistently adopted a pro-growth policy," says John Harvey, director of the county planning department. "What's happening to Brunswick County is happening to the entire United States coastline. Growth is going to occur. The challenge is to channel that growth and have quality growth."

Most observers agree, but many believe that the county's growth has been haphazard at best and that the need for channeling it has become more critical each year. Among the problems most often cited are potential water shortages, traffic build-ups along main-traveled corridors such as NC 133 and US 17, and water pollution. Often blamed is the county's underutilized land-use plan — a problem in itself, but also potentially a part of the solution to some of the difficulties the county is experiencing.

Under the state's Coastal Area Management Act (CAMA), each of the 20 coastal counties is required to prepare and periodically update a land-use plan. Ideally, say state officials, the planning is a rational process that begins with a vision of the county's future, proceeds to a set of policies to bring about that future, and then, most important, includes ways of ensuring that these policies are carried through. "With a policy statement in mind that reflects the county's collective vision of the future," says Haskell Rhett, "county planners can think about ways to control the growth patterns in their county; direct industry where they would like it to go —put a new landfill, for example, where it won't have as significant a negative impact on people and resources." Strong subdivision regulations and a zoning ordinance would help achieve the county's objectives and ensure that fragile areas are protected and that land uses are properly situated with relation to one another.

But the county lacks both a zoning ordinance and minimum lot sizes in its subdivision regulations. Without the latter it's difficult to control the density of development, and without zoning, control of growth is all but impossible. "I've been after the county for 15 years to adopt a zoning ordinance and they still haven't done it," says Rosetta Short, a Long Beach resident and long-time member of the Coastal Resources Advisory Committee, a CAMA advisory group. "Without it

KEN TAYLOR

KEN TAYLOR

***Brunswick County's** unchecked pace of development concerns conservationists. Residential subdivisions along the beaches, like this Ocean Isle development (above), open up maritime forests, while heavy golf course development inland eliminates natural communities on a vast scale. Rainwater carries fertilizers from these fairways and greens (top) to the adjoining tidal creek, degrading water quality in the estuary.*

we've had nothing but topsy-turvy development, $100,000 houses next to gas stations, things like that." Indeed, in the most recent update of the Brunswick County land-use plan, the county itself recognizes the need for zoning. "... it is the county's intention to encourage and facilitate responsible growth. However, without county-wide zoning controls, the location of imminent development is to a large extent uncontrollable in Brunswick County."

Of course, Brunswick isn't alone in not having county-wide zoning controls. Eight out of the 20 CAMA counties lack any zoning ordinances at all, and of the 12 that have them, only six are full county-wide ordinances. Renowned for its outstanding diversity of species and natural communities, however, Brunswick's lack of zoning is the more serious because it has more to lose than other coastal counties.

Even more ambitious ordinances can be installed by Brunswick if it desires. In 1983, the county's neighbor, New Hanover County, implemented the most conservation-oriented ordinance of any coastal county. Its Conservation Overlay District protects important environmental and cultural resources by requiring developers to preserve 50 percent to 100 percent of certain resources — wetlands, maritime communities, areas of special significance, significant archeological or historical sites, and primary nursery areas. David Dumond, who mapped the county's biotic communities for the ordinance, says that for a county that wishes to practice conservation planning, the most important things to know are what's there and where it is. "Then, when potential development comes along, these valued areas must be taken into consideration in the planning effort," he says. It's an impressive and effective ordinance which so far has worked well in New Hanover County.

Epilogue

For many naturalists, Brunswick County is at a crossroads. Already the impacts of growth are dismaying those who have worked there the longest. "The county is not what it used to be," says herpetologist Alvin Braswell, curator of reptiles and amphibians at the Museum of Natural Sciences in Raleigh. Adds Peter Weigl, a professor of biology at Wake Forest University and chairman of the N.C. Wildlife Resources Commission's Nongame Advisory Committee: "I've been bringing classes down to Brunswick for 23 years, and every year I see less and less."

There are hopeful signs: For the first time, the county has been authorized by its county commissioners to put in zoning ordinances, a positive step that may help steer future development out of sensitive natural areas. And in the coming fiscal year (1991-1992), Brunswick will be updating its CAMA land-use plan, an opportunity, says Haskell Rhett, for the county to grasp "the big picture."

Even more active steps may be needed to protect the county's extraordinary fabric of natural communities from being torn asunder by haphazard development. Acquisitions by The Nature Conservancy or by local land trusts may be the surest way of protecting a valuable natural area and its freight of rare species.

Without this kind of attention, Brunswick may well lose its position as the state's premier natural garden. And that would be a loss for us all. ☒

On Gossamer Wings

Are butterflies symbols of immortality sent from elysian fields, or are they merely insects? Surely, one could not judge by looking.

written and photographed by Harry Ellis

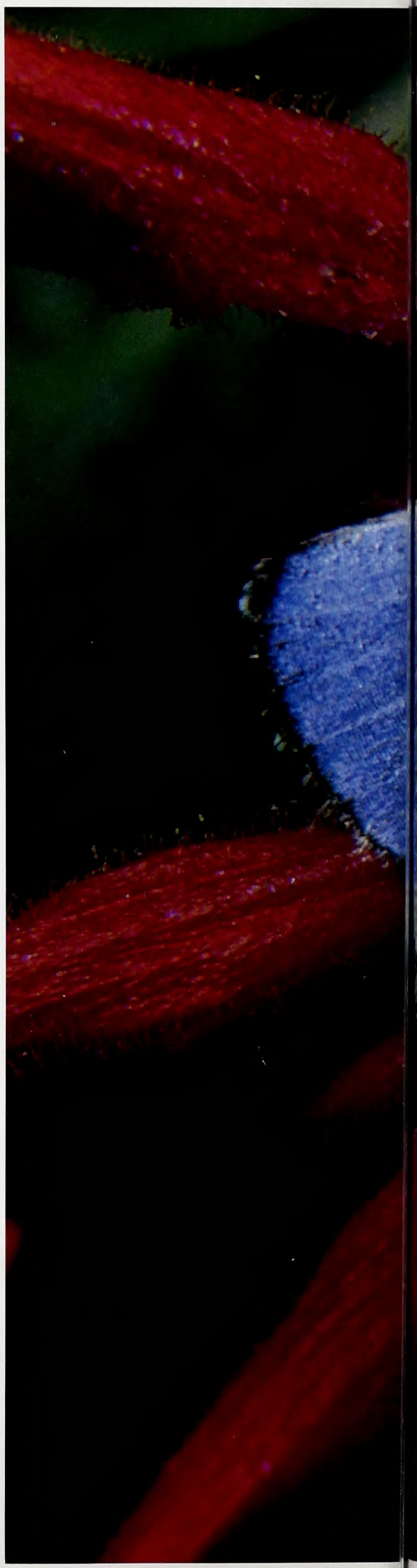
Wherever you may wander throughout the spring countryside, when drifts of dogwood blossoms are white upon the hills, you will find butterflies, rising and dancing and dipping in the warm sunshine. In summer, meadows become spacious wild gardens teeming with innumerable kinds and colors of butterflies. There are swallowtails, fritillaries, blues, sulphurs, viceroys, red admirals, and many more. Imagine, if you can, a world in which there were no birds, no flowers, and no butterflies! The ancient Greeks believed that butterflies were messengers from the gods, sent from the elysian fields, symbols of immortal life; and Psyche, or "butterfly," was their word for soul.

Today, people everywhere are captivated by their beauty, their multicolored patterns, and their astonishing life histories. With wings bearing every tint of the rainbow, they have long been the inspiration of poets and the most popular of all insects, adding their beauty to every backyard, field and meadow.

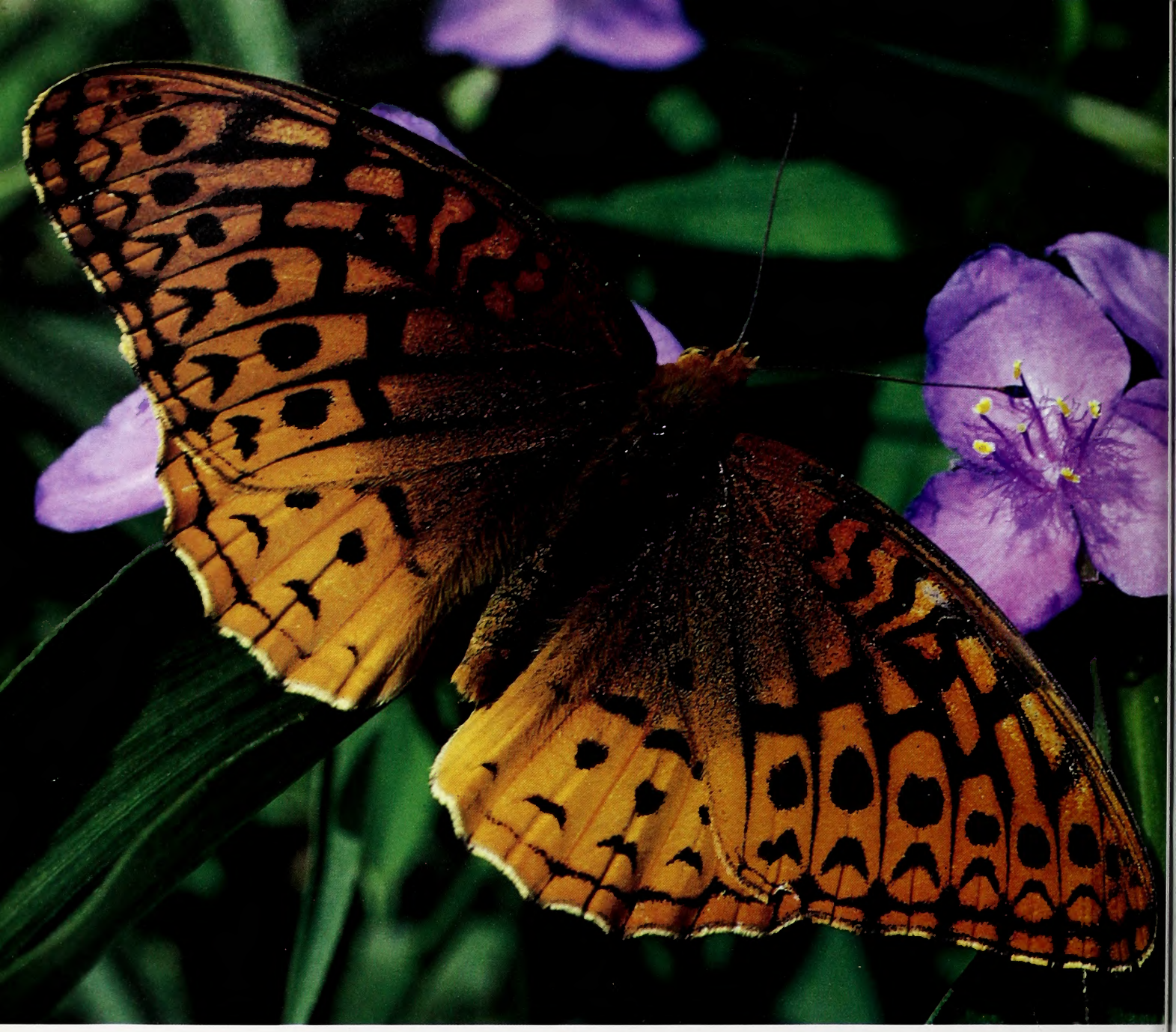
Butterflies and moths collectively make up the second largest insect order, the *Lepidoptera*, meaning "scaly-winged;" only the beetles are more numerous. There are some 15,000 species of butterflies in the world, almost 700 in the United States and Canada. With the exception of Antarctica, they occur on every continent of the earth, reaching their greatest abundance, variety and color intensity in tropical regions. To the average person, butterflies are more familiar than moths because they are active during the daylight hours, while most moths fly at night. Our American butterflies range in size from tiny midget blues to the large, showy tiger swallowtails.

The bright colors and vivid patterns come from millions of tiny pigmented scales that cover the wings in overlapping rows, somewhat like shingles on a roof. Iridescent hues—chiefly blues, greens and violets—are produced when light strikes the parallel grooves and ridges of certain scales, refracting the light like a diamond, a rainbow or a crystal chandelier.

Such beauty is unlike manmade beauty. Under great magnification, everything made by human hands shows its imperfections, is rough and malformed. But in nature—take the design on a butterfly's wing, for example—the greater the magnification, the more symmetrical and harmonious the patterns become. This beauty cannot be explained on the basis of functional need and purpose



In uncommon splendor, *this common or silvery blue butterfly* (Glaucopsyche lygdamus) *clings to a flower. Of all the species on earth, only flowering plants can match butterflies for color.*



As befits a handsome creature *such as this great spangled fritillary* (Speyeria cybele), *only a very special meal is appropriate. This butterfly eats only the leaves of violets. Because they occupy closely defined niches in nature, many butterflies will feed on only one particular plant, or portion of a plant.*

alone. A butterfly does not need a reason for being beautiful. It just is.

The senses of smell, taste and sight are remarkably well-developed in butterflies. They dine on green leaves as caterpillars and sip nectar from flowers as adults. A long tube called the proboscis is used much like a drinking straw in extracting nectar, and, when not in use, is coiled up like a watch-spring. Obtaining nectar in this way, they pollinate many flowers and, along with bees and a few other insects, are effective agents of cross-pollination.

Every butterfly must pass through a four-stage sequence of changes called metamorphosis—from egg, to larva, to pupa and finally to the familiar winged adult. These changes, which make up their life histories, are much alike in all butterflies, though there are certain variations, of course, according to the species. Generally, the biography of one closely parallels that of most others.

Soon after breeding, the female seeks out some specific kind of plant on which to lay her eggs, a type that will provide the required nourishment for her choosy young. Monarch caterpillars will eat only milkweed leaves; the great spangled fritillaries, the leaves of violets; Baltimores dine on turtlehead leaves; and painted ladies on thistles. Most butterfly eggs are beautifully colored, sculptured and patterned with intricate artistic designs, but whether such ornamentation serves a useful purpose is not known.

Within a few days the eggs hatch and the larvae that emerge are of various colors, shapes and sizes, depending upon the species. Each caterpillar is a primitive "wormlike" creature that bears no resemblance to the winged, far-ranging beauty that it will become.

Its days are spent in almost uninterrupted and ravenous eating, pausing only long enough to shed its skin four or five times during its lifetime, growing larger with each successive molt. But a day comes when all the feasting ends, as it prepares to enter the third stage of its existence.

In obedience to a strange inner compulsion, it now finds a twig or other suitable support and there anchors itself. Presently the skin splits and falls off, and, as if a magic wand had been waved, the hanging caterpillar is instantly and mysteriously changed to a strange-looking, mummy-like pupa or chrysalis, usually brown or green, without legs, ears or eyes. Most butterflies spend the winter as pupae, buffeted on their twigs by every winter storm and gale; in some species — the monarch, for example — the pupal state lasts only a few days. As the period of its dormancy nears the end, dramatic changes take place inside the chrysalis. The caterpillar's old organs break down and waste away. New ones, more fitting for the aerial life of a butterfly, are fashioned.

When its time has come, the chrysalis splits open and from its end comes a bright, new butterfly with wet and crumpled wings. It climbs up the swaying pupal shell and clings to it while its wings expand and dry. The ugly, creeping caterpillar that retired into the chrysalis and went to sleep, awoke an elegant butterfly with the most beautiful wings that nature could devise. It is not surprising that to the ancient Greeks the butterfly was a symbol of the soul.

For most butterflies, there is only a brief span of adult life. During that time, they fly over the green meadows, sipping nectar from flowers, seeking mates and begetting their kind. When the eggs have been laid, the majority of butterflies have only a few more remaining days. The bright, lifeless wings soon drift quietly down among the meadow grasses and return, as all living things must, to the all-embracing earth.

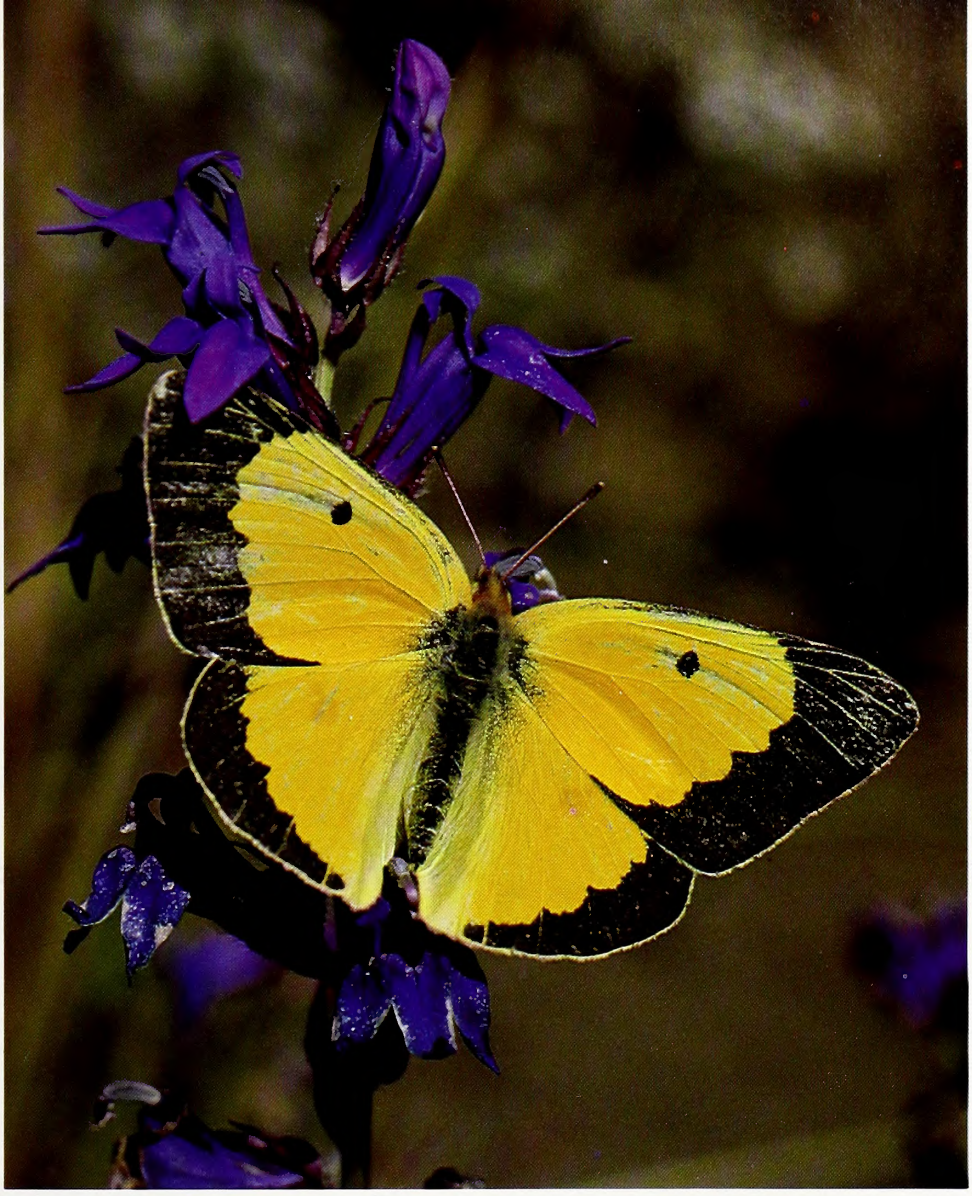
A few of our butterflies are, on occasion at least, far-wandering travelers. Spring migratory flights of painted lady butterflies are sometimes seen moving northward in masses of many thousands, perhaps millions, of individuals but there is little evidence of southbound flights in the fall. On the other hand, large swarms of buckeyes, common sulphurs, and a few other species, have been observed moving south in autumn, but northbound return flights are weak or non-existent. All these migrations are irregular, unpredictable, and have no definite purpose so far as we can tell.

No other butterfly can equal the monarch's annual journey of almost 2,000 miles from the eastern United States and southern Canada to the Sierra Madre Mountains of Central Mexico's Transvolcanic Belt. Here, at some 9,000 feet elevation, the migrants descend and blanket the Oyamel fir trees in densities as high as 4 million per acre.

As several species of milkweed plants are native to Mexico, some scientists believe that far back in geologic time the monarch originated in Mexico and slowly spread northward, and that by migrating to these mountains each autumn, they are simply "going home for the winter."

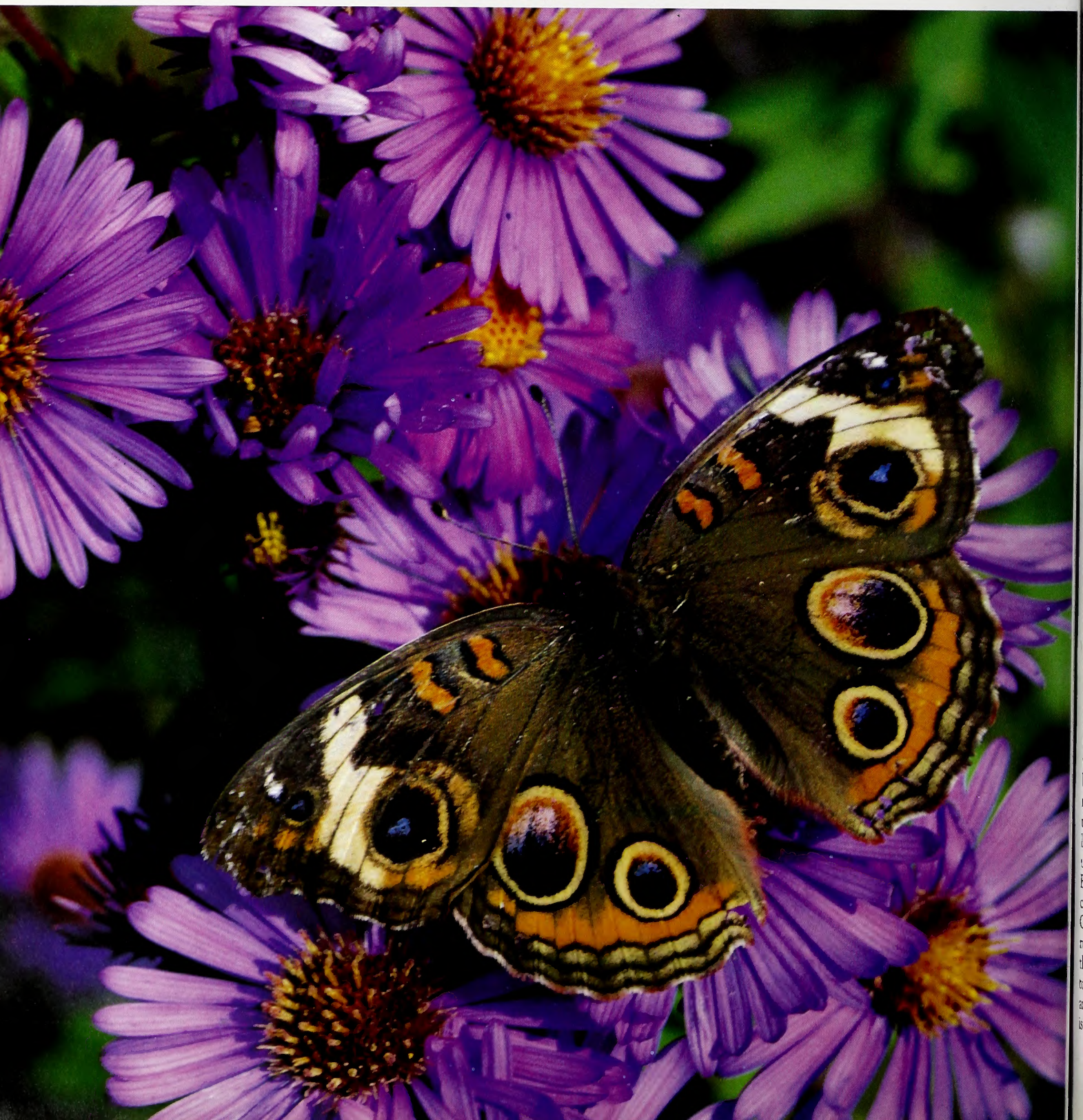
Up until 1975, no one knew precisely where they spent the winter, for after reaching our Gulf Coast they just seemed to vanish. Then millions of overwintering monarchs, in a state of semidormancy, were discovered on a 20-acre tract in the Mexican highlands. Since then, several separate wintering colonies, a few miles apart in the same general area, have been located. They had been migrating here for many centuries, yet the location long eluded the scientific world.

With the coming of spring, instinct again drives them northward. Mating along the way, eggs are laid on young milkweed plants in the southern United States. These adults soon die, but succeeding generations complete



***This orange sulphur** butterfly (Colias eurytheme) seems to know that its delicate yellow wings are perfectly paired with lavender flowers. Scientists know that butterflies have well-developed senses of smell, taste and sight, but does taste extend to color coordination as well?*

Perched on a wild *New England aster, the buckeye butterfly* (Precis laVinia coenia) *sports a pattern of eye-like circles on its wings that may frighten some would-be predators. The colors are formed by millions of tiny scales that serve as prisms to refract the light and create various hues.*



the northward journey that reaches as far as southern Canada. Of the three generations produced, it is the last one that makes up the bulk of the southbound migrants.

Measures have been adapted by the Mexican government to protect the overwintering monarchs. Timber cutting has been banned in a wide area around the wintering roosts, but this, in itself, has created additional problems. The rapidly expanding rural population of these mountains depends chiefly upon the lumber industry for survival. Because of the governmental ban on timber cutting, landowners are losing income and Campesinos are losing jobs; tensions are running high. Though armed guards patrol the area, angry Campesinos have threatened to torch the butterfly groves. It is hoped that an agreeable solution can be found before it is too late for the monarch.

In the bleak winter world of ice and snow, there are no bright winds of butterflies to command our attention. For most, life has retreated into the chrysalis; for a few to the egg, the larva and the hibernating adult. The red admiral, buckeye, question mark, mourning cloak and a few other butterflies hibernate as adults. After the leaves have fallen and a whisper of winter is in the wind, these butterflies seek out hollow trees and other sheltered locations, and there wait — in a state of torpor, somewhere in the realm between sleep and death — for spring's magical touch. With the ending of winter, the earliest of the hibernating adults to take wing is the mourning cloak, our first butterfly of spring. There is something about seeing these dark, cream-bordered wings soaring through the March woods — even before the first hepaticas have bloomed — that lifts the spirit, and, watching them, you sense that the Great Awakening has begun. ⊠

The gray hairstreak (Strymon melinus) *is a swift flier, and the most common of the hairstreaks. It is readily recognized by the prominent orange spot against its blue-gray wing.*

Caught From Farm Pond

New State Record Largemouth Bass Landed

Written and Edited by Vic Venters

After catching a bass that weighed 9 pounds, 4 ounces, and having it mounted, Charlotte's Bill Wofford thought he would never again have to take another big fish to the taxidermist.

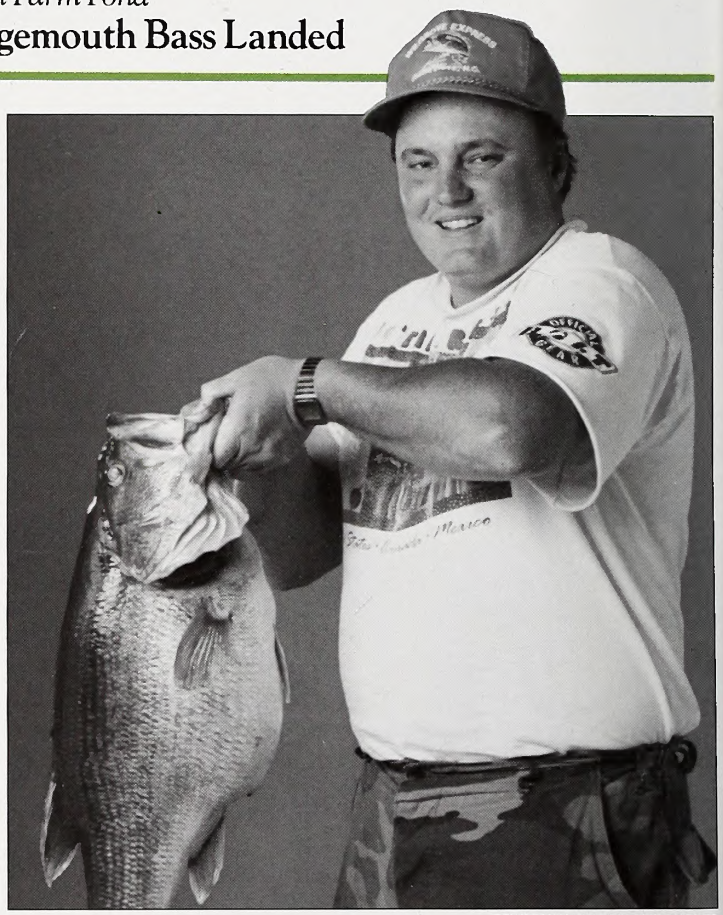
That is, until he caught the new state record largemouth bass.

Wofford landed the 15-pound, 14-ounce behemoth from a small 3-acre farm pond in Union County near Waxhaw on a rainy Friday, March 29. The big fish hit a white Bayou Boogie lure about 10:30 a.m. near an underwater ledge about 15 feet from the shoreline in the pond. "I knew I had a big one on at first," Wofford said, "but I didn't know how big. He never jumped."

Instead, the big fish began deep, surging runs. "He ran my line out twice to the middle of the pond," Wofford explained. "There isn't much cover in the pond, but what little there was he headed for." Although Wofford's baitcasting outfit was spooled with only 10-pound test line, he managed to hold the fish from the cover. "I got the fish turned and on his side. When his head came up, I saw he had only one hook in his upper lip. I thought if he jumped or shook his head, I might lose it."

After about a five-minute battle, Wofford's fishing companion, Kent Long, grabbed the tired fish with a lip-hold and lifted it from the water. "The fish pulled real hard, but she fought like a big ol' carp," Wofford said. "I've had 7- and 8-pound bass fight a lot better when it comes to jumping."

His new catch will be a tough one to beat, and Wofford isn't complaining. "I'm real happy to have the new record," he said. "I thought that 9-pound, 4-ounce fish would be my last mounted fish but I guess I have to get this one mounted too." Wofford's catch shattered the old state record largemouth bass held by Leonard Williams. That fish, caught from Santeetlah Reservoir in 1963, weighed 14 pounds, 15 ounces.



DON WILLIAMSON/CHARLOTTE OBSERVER

Record Largemouth: *With this 15-pound, 14-ounce largemouth, Bill Wofford holds the new state record for North Carolina's largemouth bass. Wofford caught the record fish in late March in a small farm pond in Union County near Charlotte.*

Rules take Effect July 1

New Regulations for Hunting License Buyers

Remember, hunting and fishing licenses expire at the end of June in North Carolina. If you wish to purchase a hunting license after this year's expiration date, keep in mind there are new requirements for purchasing hunting licenses. On or after July 1, 1991, persons wishing to buy any North Carolina hunting license must show they have either passed the state's certified hunter-safety course or show they owned a hunting license prior to July 1, 1991.

Your old hunting license can serve as proof of prior hunting-license purchase. If you cannot prove you had a license before July 1, or you have not passed a certified hunting-safety course, you will need to pass the certified safety course. Potential hunting license buyers are urged to enter a safety class as soon as possible to avoid an anticipated rush on class space. "We are strongly advising people who wish to buy a hunting license and who need to take the certified hunting-safety course to enroll before the last minute," said Capt. Wilton Pate, head of the N.C. Wildlife Resources Commission's hunting-safety program. "Otherwise, hunters may not be able to get into a class until after a time when they want or need the license." To hunt, purchasers of Lifetime Sportsman's Youth or Infant licenses must also pass a certified hunter safety course or be accompanied by an adult at least 21 years of age who is properly licensed to hunt in North Carolina. For more information, contact the Wildlife Commission's Division of Enforcement at (919) 733-7191.

Tagged Marlin Recaptured Off Hatteras

A blue marlin captured and tagged near South Pass, Louisiana, in August 1989 was recaptured near Hatteras Inlet, and thus has set the record for the first documented migration from the Gulf of Mexico to the U.S. Atlantic coast.

The marlin was estimated to weigh 100 pounds when released and 200 pounds at the time of recapture almost one year later.

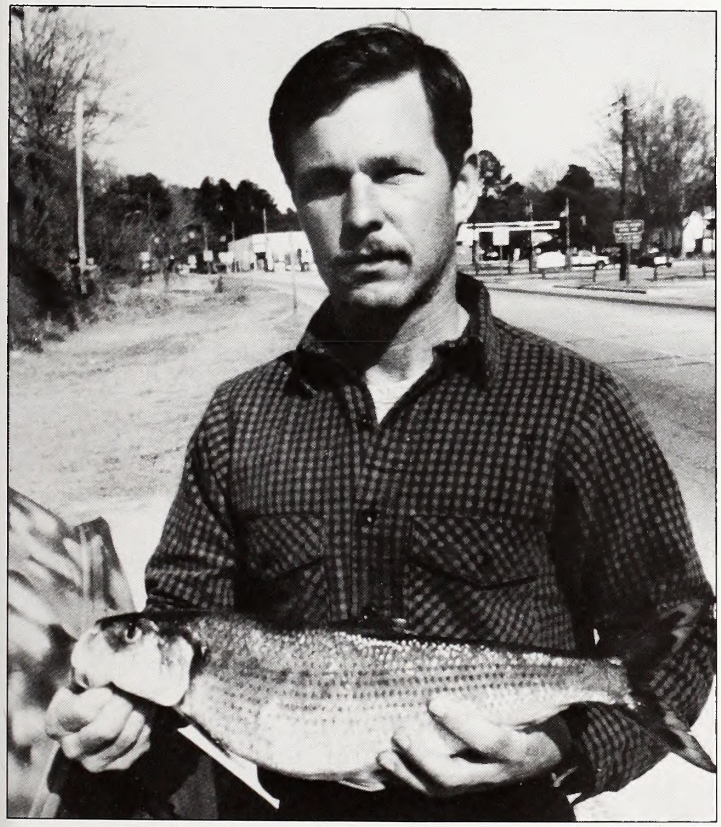
(courtesy of *Louisiana Conservationist* magazine)

Caught Near Kinston

Record Hickory Shad Taken

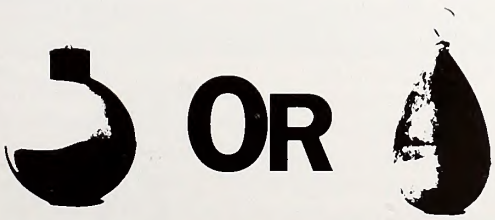
Contentnea Creek is known as one of North Carolina's finest shad streams and its reputation proved to be well deserved this February when Richard McCarter of Kinston pulled a new state record hickory shad from the picturesque Neuse River tributary.

McCarter caught the fish—a 2-pound, 14-ounce female—at the mouth of the creek on February 28 on a small spoon with shad dart trailer. "I didn't know I had a record," he explained, "but I thought I was close." McCarter was using light tackle with 6-pound test line. He had previously caught a hickory shad weighing 2 pounds, 6 ounces.



RICHARD McCARTER

Record Hickory: *Richard McCarter took this new state record hickory shad in Contentnea Creek this February. The catch weighed 2 pounds, 14 ounces.*



WEAR YOUR LIFE JACKET.

National Safe Boating Council and the U.S. Coast Guard

Used in Western Region

High School Donates Duck Boxes

NC WILDLIFE RESOURCES COMMISSION

Duck's Delight: *The vocational-agricultural classes at South Caldwell High School in Hudson recently constructed 66 wood duck nesting boxes and donated them to the N.C. Wildlife Resources Commission. The boxes will be used on gamelands and MARSH projects in western North Carolina. Some materials were donated by Burke County Waste Management. The South Caldwell Vocational-Agricultural Department routinely assists the Wildlife Commission with wildlife management duties.*

Nominated by Wildlife Commission

Congressman Jones Wins Bonner Award

United States Representative Walter B. Jones was named the recipient of the 1990 Bonner Award, presented annually by the National Association of State Boating Law Administrators. The N.C. Wildlife Resources Commission nominated Congressman Jones for the award.

The Bonner Award is presented annually to the government official on the state or federal level who most thoroughly exemplifies quality leadership and dedication. Congressman Jones, veteran lawmaker from North Carolina's first congressional district, serves as chairman of the House Merchant Marine and Fisheries Committee.

The National Association of State Boating Law Administrators is a professional organization whose membership includes state and provincial officials charged with administering and enforcing state boating laws.

In Honor Of: *Congressman Walter Jones was awarded the 1990 Bonner Award by the National Association of State Boating Law Administrators. He was nominated by the Wildlife Commission.*

June is American Rivers Month

Scenic New River Listed As Endangered Again

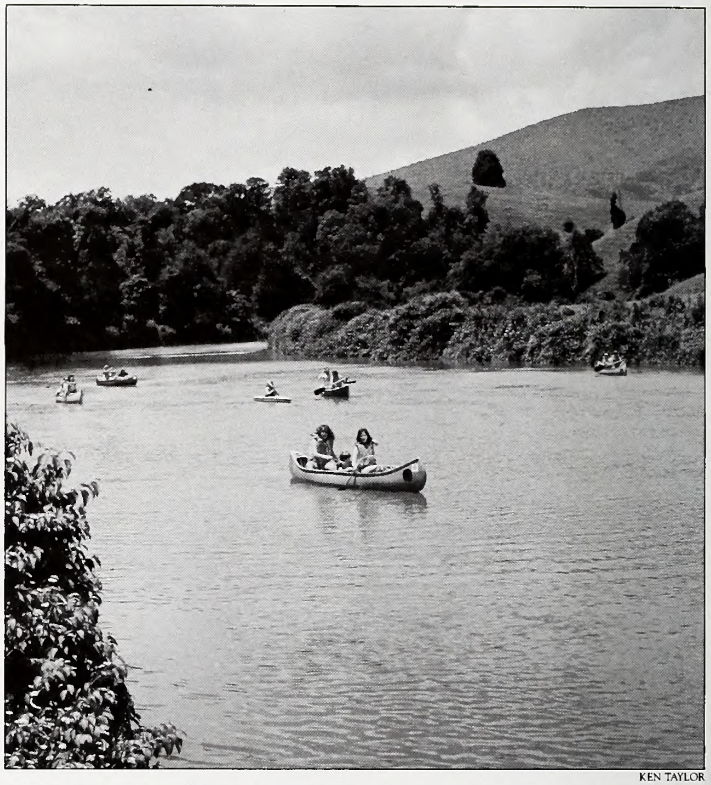
June is American Rivers Month and its arrival heralds a month of nationwide activities held to celebrate and heighten awareness of our nation's rivers. For this reason, June is a bittersweet month for many who care about the New River, one of our state's most famous and beautiful mountain rivers.

For the second time since 1989, North Carolina's New River in Ashe and Alleghany counties has the dubious distinction of being named to the "Nation's 10 Most Endangered Rivers" list by American Rivers, a national river-conservation group. The one-billion year old New River — the continent's oldest river and a designated state and national Wild and Scenic River — continues to be threatened and degraded by intense development along its banks.

The news isn't completely bad because American Rivers usually places troubled rivers on the list when there is at least some hope of saving them. Stepped up preservation efforts by involved state and federal agencies has led to "some movement toward resolving the issue," said an American Rivers official involved in the effort to save the New. However, the river's future remains uncertain.

Unfortunately, the New River is not the only troubled river in the state. There are dozens of other North Carolina rivers equally as beautiful that also need protection. As the human population of North Carolina grows, it becomes inevitable that more of our state's fragile streams and waterways will face pressures similar to those facing the New.

One of the best things you can do to help protect your local rivers is to get involved with them. Awareness breeds action, action leads to protection. During June, over 40 events have been scheduled around the state which will heighten awareness of North Carolina rivers in conjunction with American Rivers Month. Events include fishing clinics for youngsters, canoe trips, kayaking, river cleanups, river festivals and education seminars. Check your local papers for events or contact American Rivers, 801 Pennsylvania Avenue S.E., Suite 303, Washington, DC 20003, or call (202) 547-6900.



KEN TAYLOR

Wild, Scenic and Endangered: *For the second time in three years, the New River in northwestern North Carolina has been named one of America's most endangered rivers because of intense development along its shores. June is American Rivers Month, and by involving yourself with a local river, you can work to prevent a similar fate happening to a river near you.*

Will Preserve Land Around Triad

Piedmont Land Conservancy Will Save Natural Areas

If you live anywhere near North Carolina's busy Triad — the Winston-Salem, Greensboro, High Point region — it's not hard to see how urban sprawl is rapidly changing the formerly rural character of the surrounding counties. In response, Triad conservationists have founded a new land protection group, the Piedmont Land Conservancy, to acquire and manage natural areas and green space in Alamance, Forsyth, Guilford and Rockingham counties.

Modeled after The Nature Conservancy and the Triangle Land Conservancy, the Piedmont Land Conservancy will seek to preserve natural areas through outright acquisition and through conservation easements. Although new, the group has already signed protective easements on a 100-acre farm tract within High Point city limits.

"We're already being approached by landowners," said Kathy Treanor, interim president of the Conservancy. "We are just beginning to launch our general membership drive. We're also seeking out a broad-based board of directors — conservationists, politicians and businesspeople — that will be effective in fund raising and getting the ball moving on critical issues." One of the group's first goals is to help push for and coordinate natural resource inventories for each of the four Triad counties. "With critical areas identified, then we can work to save them," she said.

For more information or to join, contact the Piedmont Land Conservancy, P.O. Box 4025, Greensboro NC 27404, or call (919) 299-2651.

"Best rabbit dog I ever had."

Conservation for Kids

Conservation Youth Camp Next Month

This July, North Carolina young people will be heading for the Sandhills for the ninth annual Fur, Fish 'N Game Rendezvous. Sponsored by the N.C. Agricultural Extension Service, the N.C. Wildlife Federation, the N.C. Wildlife Resources Commission and the Wake County Wildlife Club, the Fur, Fish 'n Game Rendezvous has been held since 1983 to teach youngsters about the outdoors and the environment.

The 1991 camp will be held at Millstone 4-H Camp in the Sandhills of North Carolina from July 14-19. Courses offered include wildlife ecology and management, forestry, outdoor ethics, map and compass, fishing, aquatic biology, first aid, and more. All courses are taught by professionals committed to the conservation of our natural resources.

The camp is open to all boys and girls between the ages of 11 and 15. For an application on the Fur, Fish 'N Game Rendezvous, contact your county 4-H agent with the N.C. Agricultural Extension Service. The fee is $120. The youth does not have to be a 4-H member to attend. Adult volunteers are also needed to assist youth at the camp. For additional information, contact Leon Harkins at (919) 737-3242 or Dixon Herman at (704) 328-6634.

Slated for June 2-8

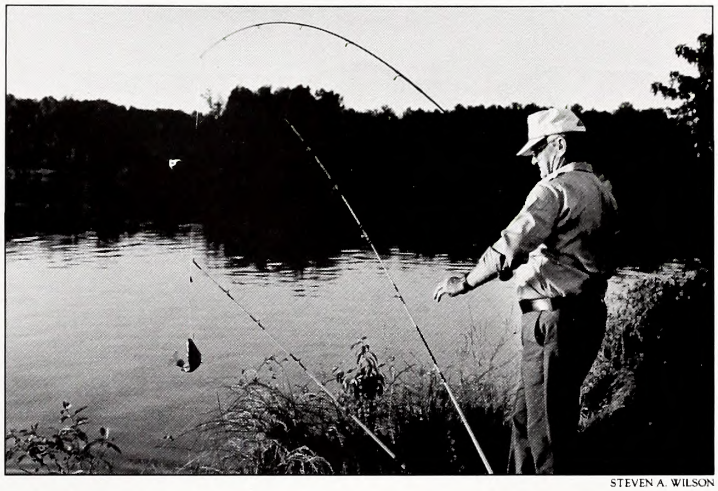
Observe Safe Boating Week

NC WILDLIFE RESOURCES COMMISSION

Sink or Survive: *Wearing a life vest when boating saves lots of lives each year. In more than 80 percent of all boating fatalities, the victim was not wearing a personal flotation device. Be sure to wear yours this summer. National Safe Boating Week will be held June 2-8 to alert boaters of the need to obey safe boating rules, regulations and practices. For more information, call the Coast Guard Boating Safety Hotline tollfree at (800) 368-5647.*

Check Newspaper for Events

National Fishing Week Events Held in June



STEVEN A. WILSON

Fishing Fun: *National Fishing Week is celebrated June 3-9 across the state. The theme for this year's fishing week is "Take A Friend Fishing." Check your local paper for fishing events scheduled for your area or call the Wildlife Resources Commission's Division of Inland Fisheries at (919) 733-3633 for more information.*

This Father's Day, give the gift of the great outdoors.

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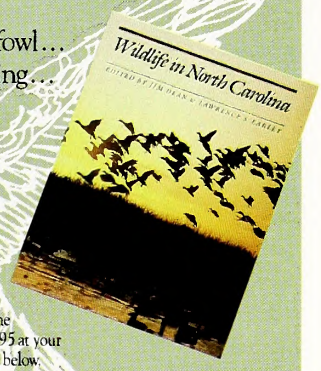

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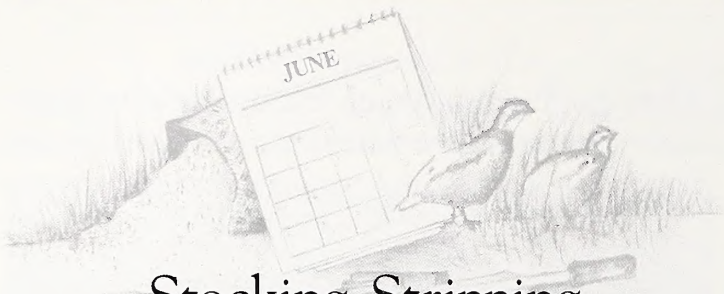


Stocking, Stripping and Spraying

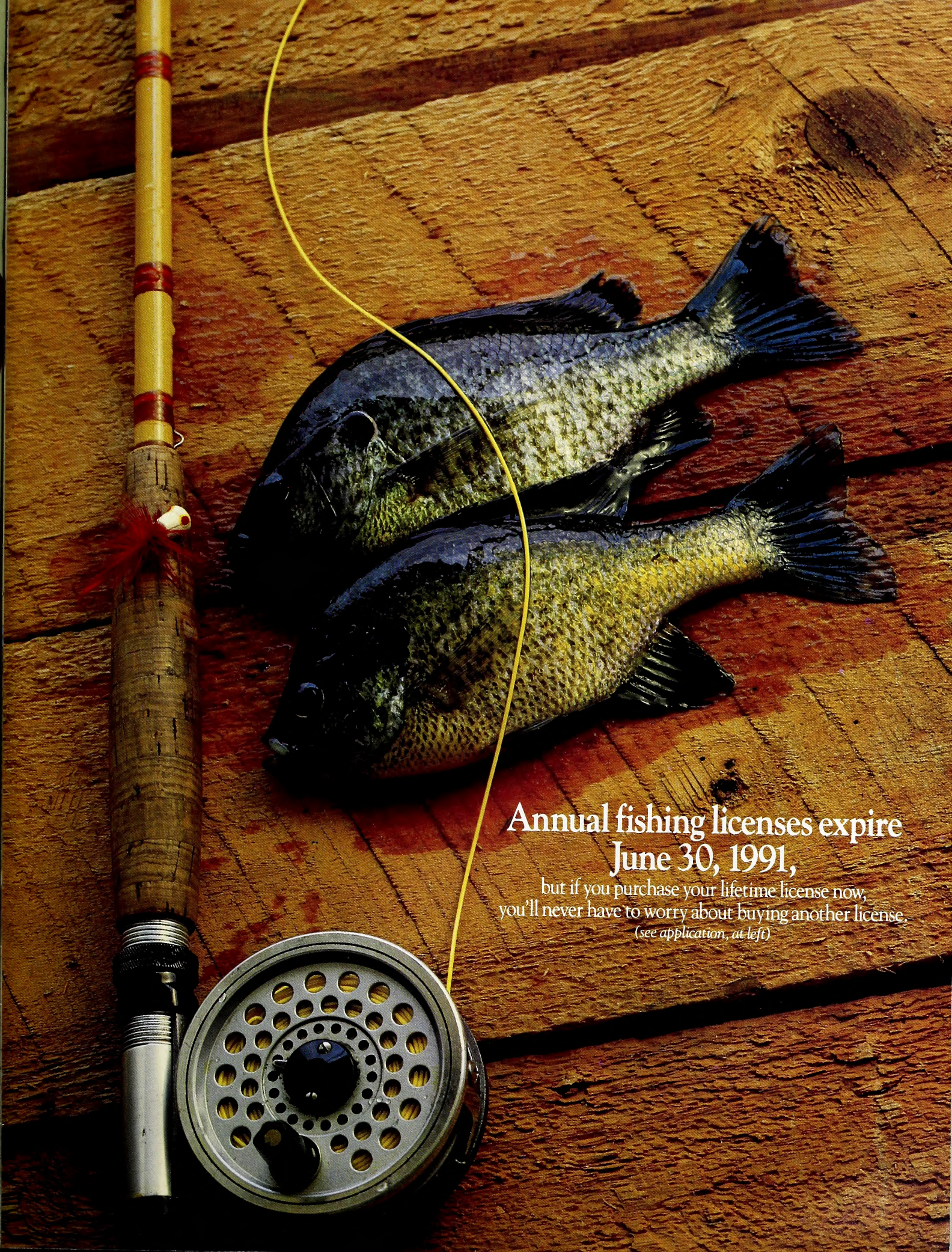
by Vic Venters

Proceed With Caution: This month, yard owners aren't the only people who are going to be busy with a mower. Many farmers and landowners pick June to mow their fields and harvest crops of wheat. However, landowners should be aware that June is the peak month for young turkeys to hatch, and bobwhite quail and other wildlife are also active on their nests. Unfortunately, wheat or fallow fields are prime nesting locations and many nests are mowed under each year. If possible, you should try to delay harvesting or mowing until next month unless absolutely necessary. If you have to mow, proceed with caution. Keep your eyes open for birds and be aware that there may be nests in the field. Adult turkeys will often flush from their nests ahead of a tractor. If this happens, back off and leave the area until the eggs hatch, if possible. It usually does no good to leave only a small area of habitat around the nest. This "island" simply exposes the nest and its occupants to predation.

Wheat Strips: No, this isn't a new cracker but it will feed a lot of birds. If you've got wheat in your fields, consider leaving a strip along the woody edge when you harvest. Not only will the seeds be eaten, but the crop strip will provide cover and insect-rich areas where newly hatched birds can forage for this critical protein supply.

Fish Stocking: June is a good month to stock bass in a farm pond. However, if you are stocking a new pond, bass and sunfish fingerlings should not be stocked together or the bass may eat too many of the smaller sunfish. Instead, bass fingerlings should always be stocked during the June following a fall (Oct.-Nov.) stocking of bluegill or redear sunfish fingerlings. This way, the young sunfish will grow enough before the bass are stocked, and this will prevent excessive predation. Numbers of fingerlings stocked will vary with pond size, but a 10 sunfish to 1 bass stocking ratio is usually followed to create a balanced population.

Pesticide Problems: If you are farming and using pesticides and other agricultural chemicals this month, be sure to use those chemicals properly around or near watersheds. When certain types of pesticides are released in or contaminate bodies of water, it can have disastrous consequences for mollusks, insects, fish and other aquatic organisms. It has been confirmed that pesticides were responsible for the massive kill of mussels—including the endangered Tar River spiny mussel—in a Tar River tributary last summer. For proper use, always read and follow the directions on the container and contact your local agricultural extension agent if you have any questions. Be especially cautious when spraying in close proximity to bodies of water. Never dispose of pesticides or other agricultural chemicals in rivers or streams.


Annual fishing licenses expire
June 30, 1991,
but if you purchase your lifetime license now,
you'll never have to worry about buying another license.
(see application, at left)

Silent Sentinels

Hooded pitcher plants poke above the dense foliage of a Brunswick County swamp, looking for all the world like tiny monks in red frocks.

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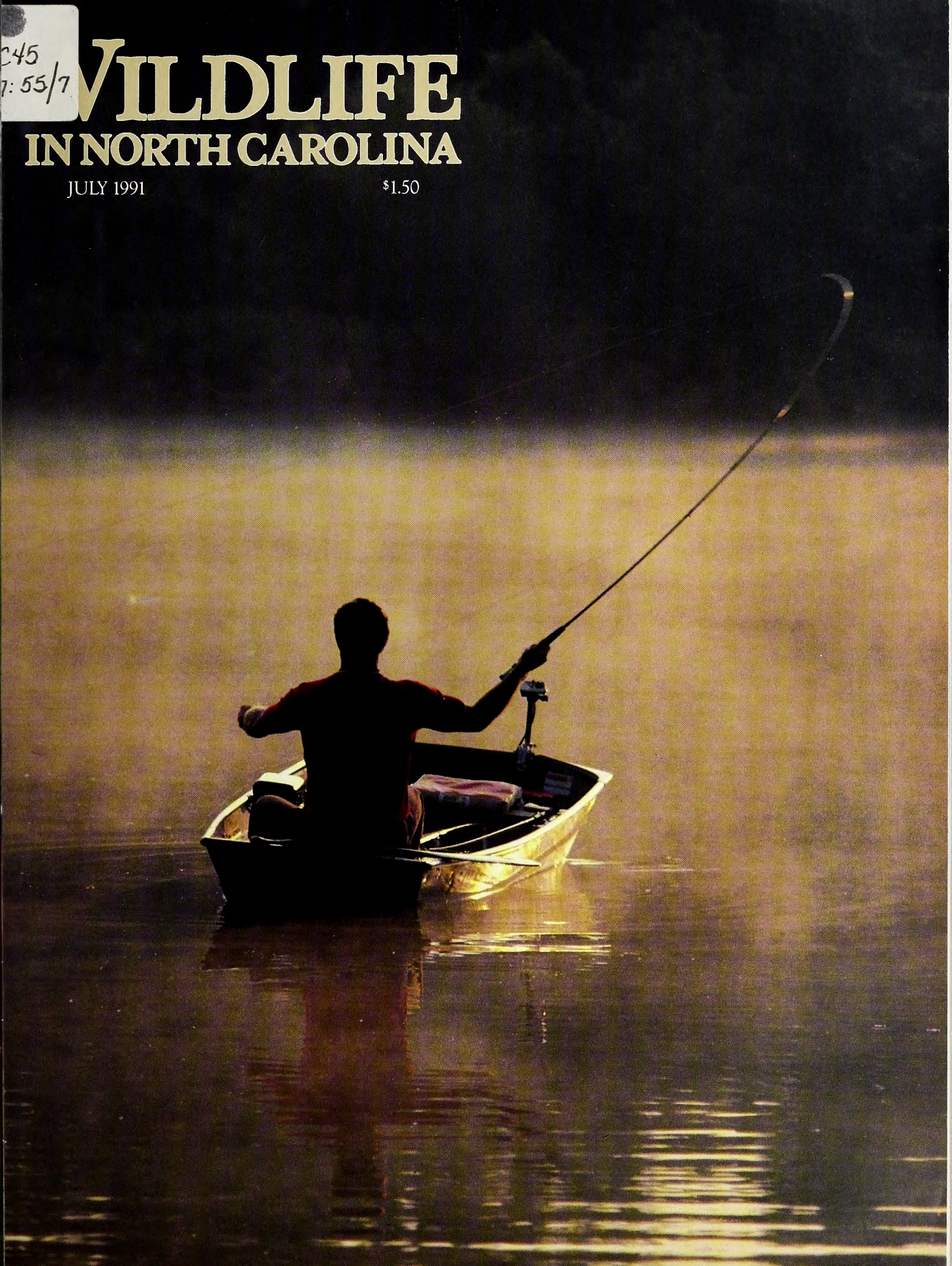

Out on the Big Blue

by Jim Dean

It was still very early in the morning when we headed east out of Morehead City on a nearly flat sea. We sat on the bow and marked our progress as the water shifted from pale emerald over shallow sand bars to darker shades of green at the sea buoy. Behind us, the sunwashed pastel cottages grew smaller and smaller until the sea and the sky erased the faint scrim of land.

The captain did not have to tell us when we passed into the Gulf Stream. The water became an intense, deep blue with astonishing clarity. It seemed as though we were sitting on the gently curved top of some giant gemstone. Patches of yellow sargassum weed drifted past, and flying fish in twos and threes burst out ahead of the boat and sailed low over the water like skeet.

JOEL ARRINGTON

"It's a big pond out here today," said the mate, as he finished rigging the baits and snapped the lines into the outriggers. "I'm afraid we may need a little chop to get the baits to skip just right for marlin."

We trolled for several hours, catching only a bull dolphin that attacked one of the baits and was accidentally snagged in the side. Though it weighed only 20 pounds, reeling it in foul-hooked was like trying to drag in a door tethered at the knob. As the hours passed, some passengers opted for naps. I may have dozed a moment or two, but mostly I sat, legs dangling, on the back of the flying bridge, taking it all in. A trip to the Gulf Stream is too uncommon, and this was an especially handsome day to be offshore. Massive cumulous clouds billowed on the horizon, their distant reflections mirrored upside down. Behind the gleaming white boat, the milky green turbulence of the wake contrasted sharply with the deep blue where the baits skipped.

From the bridge, the radio crackled with messages in accents that betrayed enviable Outer Banks upbringings. Some say the accent is a legacy of Elizabethan English, preserved for centuries by the isolation of these barrier islands. We listened, noting that no one seemed to be catching any more fish than we were.

"Oi've not seen it so c'am in many years," said one captain somewhere north of us off Hatteras. "One sport up here had one on earlier, but it broke his string. Haven't heard of any other strikes."

Later in mid-afternoon, the wind freshened. We could see it coming miles away in dark, rippled patches, and it brought the light chop the mate wanted. Baits were re-rigged, and anglers manned the fighting chairs just in case. The water danced with the kind of energy and potential that successful anglers learn to recognize. The baits no longer plowed like toy boats, but bounced enticingly over the chop. Another hour passed.

"Left outrigger, big fish under the bait!" shouted the mate.

From the vantage of the bridge, it looked more like a big brown log, but clearly something massive was dogging the bait.

"Marlin," confirmed the captain. "A blue about 300 pounds, Oi'd say."

Suddenly, the head broke the surface, the long bill poised ominously above the bait. "He's lit up," shouted the mate, marking the intense colors displayed by a feeding marlin. The marlin followed for a short distance, then slashed the bait violently with its bill.

"He's got it, drop back! Drop back! No, wait, he didn't take it."

With one bait down, but no marlin on it, we watched the other as it continued to skip on the surface. "He's under that one now," said the mate quietly. "This time, immediately give him more slack, plenty of slack until I tell you to set the hook."

Again the brown log followed, and again the head emerged, lit in hues that seemed charged with electricity. As we held our breath, the huge head followed effortlessly, almost seeming detached from the bulk below. Then the bait disappeared in a foaming boil the size of a Buick.

"Drop back!" He began to count slowly. "One, two, three, four..."

"Is he there?" asked the angler.

The mate shook his head uncertainly. "...eighteen, ninteen..." The seconds dragged. "Now, hit him! Reel up! Hit him again!"

The line was slack. The marlin had not taken the bait. We trolled until late afternoon without raising another fish, then headed in. As we sat quietly in the dark and watched the fluorescent wake, I thought of a long-dead college professor. He had told our class that the most beautiful (his word) thing he'd ever seen was a kamikaze diving through pink, sunlit puffs of flak towards his ship. I think the professor would have liked that blue marlin.

July 1991
Volume 55, Number 7

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WILDLIFE IN NORTH CAROLINA

Wildlife in North Carolina is the official educational publication of the North Carolina Wildlife Resources Commission, and is dedicated to the sound conservation of the State's wildlife and other interrelated natural resources and the environment we share with them.

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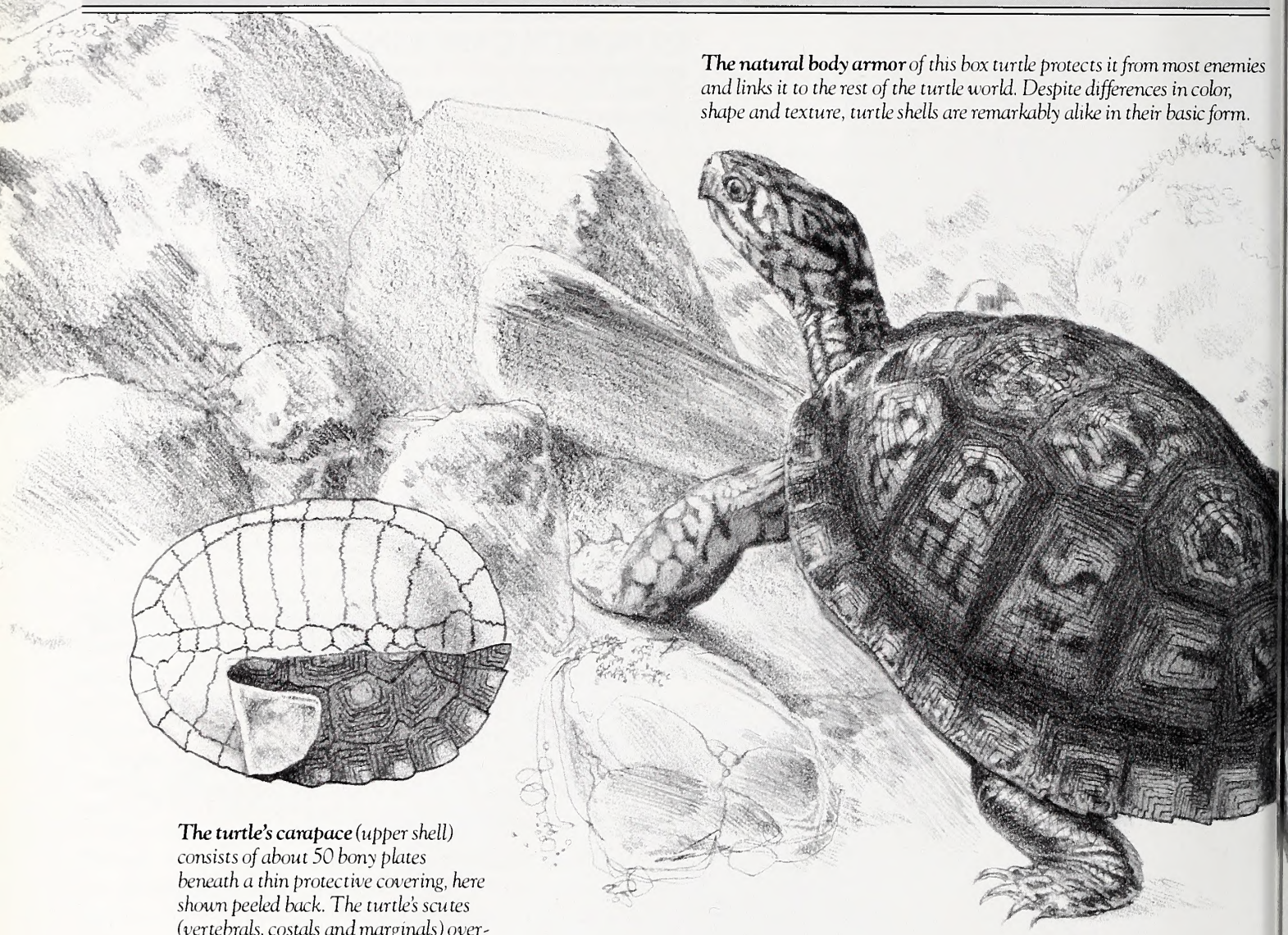


The natural body armor *of this box turtle protects it from most enemies and links it to the rest of the turtle world. Despite differences in color, shape and texture, turtle shells are remarkably alike in their basic form.*

The turtle's carapace *(upper shell) consists of about 50 bony plates beneath a thin protective covering, here shown peeled back. The turtle's scutes (vertebrals, costals and marginals) overlap the junctures of the bony plates beneath, reinforcing the shell's strength.*

The Natural Architecture of Turtles

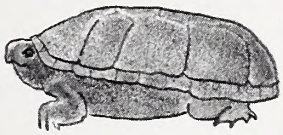
written by Lawrence S. Earley/illustrated by David Williams

Some designs for living are better than others, even in nature, although it would be hard to predict the successful ones. Consider these specifications, for example: relies on the sun to regulate its temperature; prefers to withdraw from a fight; is slow afoot. Doesn't sound promising, does it? But there's the turtle, predating dinosaurs, surviving ice ages, and still around after 200 million years.

The turtle's success is due largely to its reptilian inheritances, but no doubt its basic body plan — its protective shell — has a lot to do with it, too. Both carapace (upper shell) and plastron (lower shell) are made up of a number of bony plates. The carapace alone has about 50 bones under a leathery protective covering. Like any other vertebrate animal, the turtle has a spinal column although it is external to its soft body parts and, in fact, is fused to the carapace within the shell cavity.

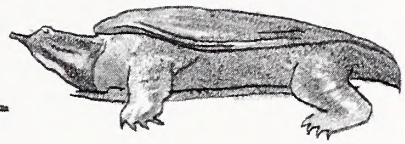
This is the turtle's basic architecture, one that has seen it safely through the eons. One major exception to it was developed by the freshwater soft-shell turtles and the saltwater leatherbacks, both of which evolved less massive bone structures and leathery skins, characteristics especially useful for aquatic species.

And then there are variations in shape, texture and decoration. Some species, like the box turtle, have a high, domed carapace while softshelled turtles have more flattened shapes. Shell textures range from the mostly smooth to those

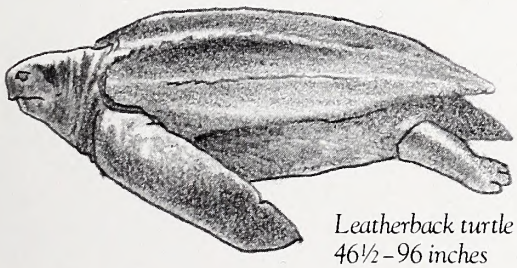


Eastern mud turtle
3–5 inches

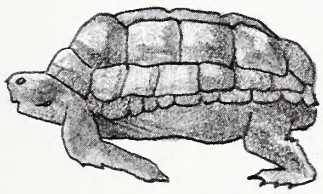
Snapping turtle
8–18½ inches



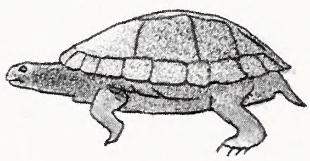
Spiny softshell turtle
5–9 inches



Leatherback turtle
46½–96 inches

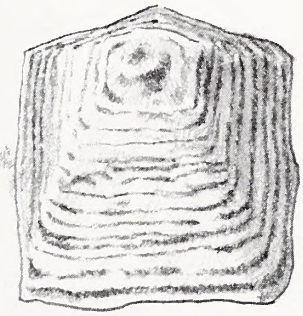


Gopher tortoise
6–14½ inches



Chicken turtle
4–10 inches

***Shell shape differs** from turtle to turtle, from the high, domed model of the box turtle to the flattened shape of the softshell turtle. Leatherbacks and snapping turtles also sport several longitudinal "keels" down their carapaces.*



***Each scute, or shield,** on a turtle's carapace is textured by concentric ridges corresponding to the turtle's growing periods. Sometimes the age of young turtles may be read by counting these rings, but for most turtles it's only an approximate way to tell the turtle's age.*

with raised, longitudinal "keels" (snapping turtles and leatherback turtles) or prominent protuberances (diamondback terrapins). Young and old members of the same species show sometimes striking differences in their shells. And turtle colors and markings vary wildly from species to species, and even from individual to individual.

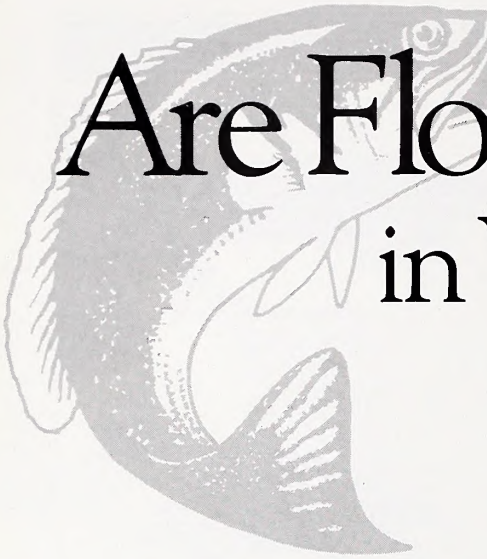
Despite these differences, turtle shells are remarkably alike in their basic form. Looking even more closely at the carapaces of many species, we find a number of striking similarities. The thin protective coating, for example, is divided into a number of shields, or scutes, arranged symmetrically in a fairly standard pattern. Normally, down the middle of the turtle's shell runs a line of five central scutes (called vertebrals) that join four pairs of scutes (called costals) on either side. Around the shell margins are a series of smaller scutes called marginals.

Remove this layer and you'd find a similar arrangement of bones underneath, but the scutes don't align with the bones. In fact, there are fewer scutes than plates, and they overlap the sutures where the bones are joined, thus reinforcing the shell's strength.

Within each scute or shield you can feel a number of raised ridges arranged concentrically around a central core. These ridges correspond to growing periods in a turtle's life, leading some to believe that you can age a turtle somewhat like you'd age a tree—by counting its "rings." This may be possible with young turtles, especially young box turtles, but it's an approximate tool at best because young turtles undergo several growing spurts in a year. Some adult turtles shed their scutes every year, and as a turtle grows older the ridges on the scutes become smoothed and indistinct, making them hard to read.

There's much to praise and much to admire about the turtle's architectural plan. Besides, a creature that can carry its house on its back, so to speak, is never caught out in the open, and that counts for a lot in the dog-eat-dog world of nature.

Are Florida Bass in Your Future?



Will Florida largemouths grow as big in North Carolina as they have in other states where they've been transplanted? Stay tuned. We're about to find out.

by Vic Venters

Without question, the successful stocking and subsequent spread of Florida-strain largemouth bass outside their traditional home range in the deep South has changed the face of largemouth bass fishing in the last quarter century. Previously confined to Florida and the lower sections of neighboring states, this fast-growing cousin of the northern strain largemouth *(Microptus salmoides)* has produced big bass and shattered state records in many states where it's been stocked.

In California, for instance, a huge Florida bass weighing 22.01 pounds was landed this spring, just shy of the world record that's stood for 58 years, a 22-pound, 4-ounce fish caught by George Perry in Georgia in 1932. In Texas, the current state record weighs in at almost 18 pounds, and the Florida bass has been so successful that it is now the only strain stocked by Texas Parks and Wildlife Department. In Oklahoma, the state record has fallen seven times since Florida-strain fish were stocked there a decade ago, and Virginia's state record bass, a 16-pound, 4-ounce fish, came from a lake where Florida bass had been stocked.

The big news is that the Florida bass *(Microptus s. floridanus)* is now coming to North Carolina, a development that has many bass anglers as excited as catfish on a stinkbait trail. Next summer, biologists with the N.C. Wildlife Resources Commission hope to begin the experimental stocking of Florida-strain bass fingerlings into Lake Sutton, a Carolina Power & Light cooling lake located off the Cape Fear River near Wilmington. The experiment should help Wildlife Commission biologists determine the Florida's suitability for selected Tar Heel waters.

The introduction poses a number of obvious questions: how long do Tar Heel anglers have to wait before reaping the benefits of Florida bass introduction? With its obvious success in some states, why aren't Florida bass being stocked in more North Carolina reservoirs? And when can anglers expect to see additional Florida stockings?

That depends, simply answered. Depends on whether the Florida bass can prosper in our muddy, turbid reservoirs. And whether they can withstand the cold of our winters. Anglers should realize there's a possibility that the Florida bass introduction could be a great success here; there's also the possibility that it may be a complete bust. Or, perhaps, the results may fall somewhere in between.

Unlike northern strain largemouth bass which are widely dispersed over a large geographic range, Florida-strain fish evolved in a narrow range of environmental conditions—the shallow, weedy and gin-clear lakes and rivers of balmy mid-Florida. Yes, they grow faster, and larger, but they perform best when most of these environmental conditions are met. In waters that are suitable for them, Florida-strain fish generally grow at about the same rate as northern largemouth for their first year or two, but then their growth rates take off. They are also harder to catch, especially on artificial lures, and this trait helps keep them alive long enough to reach the larger sizes.

Despite obvious success in some states, Florida bass do not always perform well when stocked outside of their native ranges. One critical factor seems to be sudden drops in water temperature. Stockings and numerous experiments have shown Florida bass to be very intolerant of and sensitive to rapid temperature declines. In Ohio, for instance, experiments showed 100 percent mortality to cold weather in the winter. In some cases, the Florida fish do not seem to do well in muddy, turbid waters or lakes with severe water level fluctuations.

Given these factors, the big question becomes: can North Carolina waters provide favorable conditions for the Florida bass?

"North Carolina is probably going to be a borderline state for the Florida-strain fish," said Scott Van Horn, the fisheries biologist in charge of the project for the Wildlife Commission. "We've found that our native largemouth bass stocks already have some Florida genes in them. However, we have a number of questions as to whether the pure strain fish can prosper here."

In the past, many states—including

In states like California, *the introduction of Florida-strain largemouth bass has been highly successful, as this 20-plus pound largemouth attests (right). A planned experimental stocking of Floridas in North Carolina next summer may help biologists determine if the fish is suitable for our waters.*

VIC VENTERS

Under present plans, *Florida bass will be stocked in Lake Sutton, a CP&L cooling plant lake near Wilmington. Sutton's clear water is heated and full of aquatic vegetation, factors that make it perhaps North Carolina's best bet for establishing the fast-growing Florida strain. Two CP&L biologists, Phil Bain (left) and Tom Thompson, test Sutton's water for temperature and oxygen levels.*

North Carolina — have taken a conservative approach to stocking Florida bass in their waters. In the early 1980s, several influential fisheries biologists argued against expanding the range of the Florida because they feared the consequences of possible "genetic pollution." Because the two bass subspecies readily interbreed, these biologists argued that there was a risk of introducing the Florida's cold-intolerant genes into native northern strain bass stocks, thereby weakening the entire bass population's resistance to cold. According to this scenario, the growth rates and winter survivability of a state's bass population could actually be hurt by Florida introductions, rather than helped.

Fortunately, the experiences of other states seem to discount the "genetic pollution" fears. They also provide North Carolina with some indications of how Florida bass stockings may work in the Tar Heel state. On the down side, our biologists have to toss the California and Texas results — where Florida stockings have been an unqualified success — into the "Not Applicable" bin. Both of those states have considerably warmer climates than North Carolina and the fish benefit from longer growing seasons. Also, California's big bass habitat is unlike anything found in North Carolina. There, bass reach 15- to 20-plus pounds by gorging on rainbow trout released in reservoirs several hundred feet deep.

For our purposes, Oklahoma and Virginia may provide better examples. Like North Carolina, both of these states are on the borderline for providing suitable habitat for Floridas. Since the 1970s, the Oklahoma Department of Wildlife Conservation has stocked pure Florida strain bass and *intergrades* — bass with a mixture of Florida and northern genes — into over 70 lakes. "We are right on the edge of where Florida bass survive," said Greg Summers, director of the Oklahoma Fishing Research Laboratory. "We've found the southern half of the state most conducive to the Floridas, the northern half is not. The fish do not do well up there."

In the lakes where they do prosper, Oklahoma biologists have found that intergrades perform the best, combining the Florida's better growth rates with the northern's better wintering survivability. The good news is that in lakes where they do poorly, there are no indications of genetic pollution harming the native bass populations. The Floridas simply die out and disappear. However, even in the lakes in Oklahoma where the Floridas do well, it's been found that supplemental stocking of pure strain Floridas has to be maintained to keep enough Florida genes in the intergrade fish to make a positive contribution to growth rates. At last count, the Oklahoma state record topped out at over 13 pounds — a nice fish, but hardly comparable to the behemoths of California, Florida or Texas.

So far, results are also mixed in Virginia. There, Florida bass stockings have been conducted on an inconsistent basis from the 1970s. In 1985, a new Virginia record bass weighing 16 pounds, 4 ounces was pulled from Lake Conner where Floridas had been stocked in the mid-'70s. While it was never proved that the fish was a pure Florida, or even had Florida genes, the catch generated intense interest from fishermen.

Currently, the Virginia Department of Game and Inland Fisheries is analyzing its Florida bass stocking at its new Briery Creek Reservoir to determine the suitability of the Florida in Virginia. "Because of angler interest, we began an experimental stocking of Florida bass in Briery Creek, an 845-acre

reservoir," said Bill Kittrell, district fisheries biologist for Virginia. "In 1986, we stocked the lake with a 3 to 1 ratio of Florida largemouths to northern strain bass, then did so again in 1987."

At first, results were promising. "We got excellent growth off the fish we stocked initially," Kittrell said. "However, when the lake was opened in 1989, anglers were not catching the larger fish that we had seen in there. We had lots of smaller fish, but we don't know what happened to the 1986-year class."

Briery Creek is full of standing timber, creating ideal bass habitat, but it is also relatively shallow, making its Florida bass population potentially susceptible to rapid temperature drops. "We had two very cold winters that may have killed off a lot of the pure Florida bass because most of what we are seeing today are intergrades, the product of northern bass and Florida bass that have bred," Kittrell explained. "This spring, we are starting to see a few big fish show up, though. Before we can draw any conclusion, we will have to continue to track the fish population and see how it develops."

Like Oklahoma, Virginia has not seen any negative genetic fallout. "We've never seen any detrimental effects to the native fish population," Kittrell said. "If any characteristics are passed on, natural selection would ensure that the best traits are passed on because the fish that cannot survive will not survive to breed."

Because it is similar to many small Piedmont North Carolina reservoirs, what eventually happens with Virginia's Briery Creek fishery may provide some answers as to how the Florida will fare in the average Tar Heel lake or reservoir.

Wildlife Commission biologists believe that Sutton Lake will provide North Carolina's best shot for establishing a viable Florida bass fishery. Sutton is located in the southeastern corner of North Carolina, placing it in the state's most temperate weather zone. The 1,060-acre lake also receives a constant supply of heated water from the CP&L power plant, pushing temperatures several degrees above any surrounding waters. For example, the average February water temperature in Sutton is 56° Fahrenheit — pretty cosy for that time of year. While it's shallow compared to Piedmont reservoirs, Sutton has holes as deep as 30 feet in some places, giving bass a refuge where they may be less susceptible to rapid temperature drops. The water is also clear, full of aquatic vegetation, and Sutton's forage base is a mixture of sunfish and gizzard shad — all potentially positive factors for the Florida bass. Nor does Sutton suffer from significantly fluctuating water levels.

Beginning in the summer of 1992, there are plans to stock about 70,000 Florida bass fingerlings each year for the next three years in Sutton. Samples will be taken regularly to compare the growth, survival and catchability rates of the Floridas, the native bass and their intergrades. Studies will also be performed to see how the genetic composition of the bass population in the lake changes. Later studies will track angler success in Sutton. The bass population in the lake is already being protected by a 12- to 16-inch slot limit regulating that all bass between those sizes must be released.

Wildlife Commission biologists are cautiously optimistic about Sutton. "A lot of evidence shows Florida bass do better in clear water that's got some vegetation in it," explained Van Horn. "Sutton has that and the heated water it receives should help the fish during the winter. On the other hand, it is also relatively shallow and could be susceptible to sudden cold fronts which can rapidly lower the temperature."

Success in Sutton isn't guaranteed, and even if it is, anglers should not think that positive results there automatically translate into success elsewhere in North Carolina. "Sutton is really unique in North Carolina in terms of its habitat. The decision as to whether Florida bass will be stocked elsewhere in the state depends on how well the fish performs there," Van Horn said. "Even if it does well at Sutton, that does not imply that Florida bass will do well at other North Carolina lakes or reservoirs."

"I would predict in advance that Floridas would perform poorly in some of our Piedmont reservoirs," Van Horn said. "A lot of our Piedmont reservoirs stay muddy and heavily silted through the year. And because of that siltation, there is almost none of the vegetation that Floridas seem to prefer. Floridas are also going to be contending with much colder temperatures than those found in Sutton. None of these environmental factors favor the Florida.

"This is not to say that Floridas will not work in other places in North Carolina, but anglers shouldn't get their hopes up," Van Horn cautioned. "If they are going to perform for us, I think it will be in a fairly narrow band of habitat."

At any rate, some North Carolina anglers are going to get a chance to see, evaluate and — possibly — catch the bass that has caused all the excitement. What happens after that?

Who knows, but keep your heavy line spooled and your fingers crossed. ⊠

OUTDOOR OKLAHOMA

***Although Florida-strain bass** grow fast and large in suitable waters, biologists have many questions about their ability to prosper in our colder, more turbid waters. Many of North Carolina's large Piedmont reservoirs do not appear to offer habitat conducive to the Florida-strain bass.*

The COBALT RIVER

WALTER STEARNS

The Gulf Stream spins in the Atlantic like a giant wheel, its warm current fueling an incredibly powerful oceanic engine that spawns a rich diversity of life and influences the weather on four continents.

by Joel Arrington © 1991

Historians describe how island residents north of Cape Hatteras would wander down to the beach on pleasant summer afternoons to watch sails on the horizon. Tall-masted ships accumulated there by the score some days, tacking to and fro while their masters waited for a wind shift that would permit them to continue south, threading the needle between deadly shoals off the cape and the northward rush of the Gulf Stream not far offshore.

Many failed, much to the delight of some of the Outer Bankers, contributing to the already established reputations of Diamond Shoals as a maritime hazard and residents as wreckers. The northward-flowing current of warm, cobalt water that penned up the passing ships and helped create the dangerous weather conditions led this place to be called the "Graveyard of the Altantic." While fewer ships are lost here these days, the Gulf Stream remains one of the most fascinating features in all the seven seas.

The Stream off North Carolina runs at a good pace — 2½ knots at the core — but in the Straits of Florida, it rushes at up to seven knots, 30 million cubic meters of water per second. Its speed decreases "downstream" (up the coast of North America), but the volume increases so that off the Canadian maritimes the flow is 200 million cubic meters per second. That's more than the combined flow of all the rivers of the world.

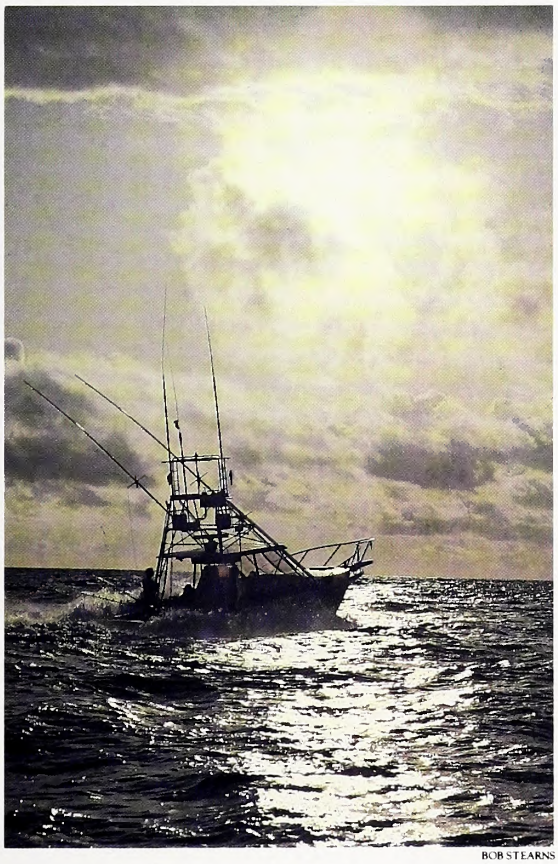
While the Gulf Stream is often described as a mighty river, it differs substantially from any land-bound river. Except for a fraction of its length, for example, it does not reach bottom, but rather lies as a lens of warm water over cold. Unlike a river, the Stream sends off divergent currents and eddies which may circle back, mixing with or sliding under or over the main stem.

Large petroleum tankers, on 1,600-mile runs from New Orleans to New York take advantage of the Gulf Stream's consistent current. Such strategy might save four hours and over $5,000 in fuel per trip. Some ships make the journey twice a month, saving big sums even for an oil company.

If we imagine ourselves in fixed orbit approximately above Venezuela, we would be in a good place to see the North Atlantic Ocean and to measure the Gulf Stream in its entirety. Noting how it squeezes between Cuba and Florida, we would see that it makes a hard left turn and runs up beside North America and across to Europe. There it splits into complex tendrils, some bearing northeast from the gyre and eventually reaching Norway, some curving southward along the African coast to join the Canary Current. Turning west off Africa, the Gulf Stream is driven by its principal motor, the tradewinds. Trades are steady winds blowing diagonally toward the equator from the northeast and, in the Southern Hemisphere, from the southeast. Trades blow the Gulf Stream through the Antilles and back to the Caribbean and the Gulf of Mexico to complete its circuit. The idea that a bottle thrown in at Key West will come around again in about three years is not just a theory. Derelict ships have done just that.

From our vantage above Venezuela, we can also see a roughly doughnut-shaped circulation around a section of the North Atlantic called the Sargasso Sea. Winds drive warm water toward the center while other forces help to pile it up perhaps 6 feet higher than sea level at Hatteras. Pressure under the center of the mounded-up Sargasso pushes water to areas of less pressure, the edges. This slope produces forces that help form the Gulf Stream.

The Gulf Stream wheels in an ocean that makes up only a tenth of the world's seas, yet it remains by far the most important current for western culture. Early voyagers followed the current to the Americas. Geologists say sediments carried by the Gulf Stream raised Florida from the ocean. It makes possible the fabulously rich fisheries of the North Atlantic and the moderate climate of England and Scandanavia. Some say its warming influence made Europe the cradle of western civilization instead of a land of polar bears and reindeer which, at its latitude, it otherwise would be. At the very least, its volume, flow and persistence profoundly influence the physical, chemical and biological processes of the North Atlantic.



BOB STEARNS

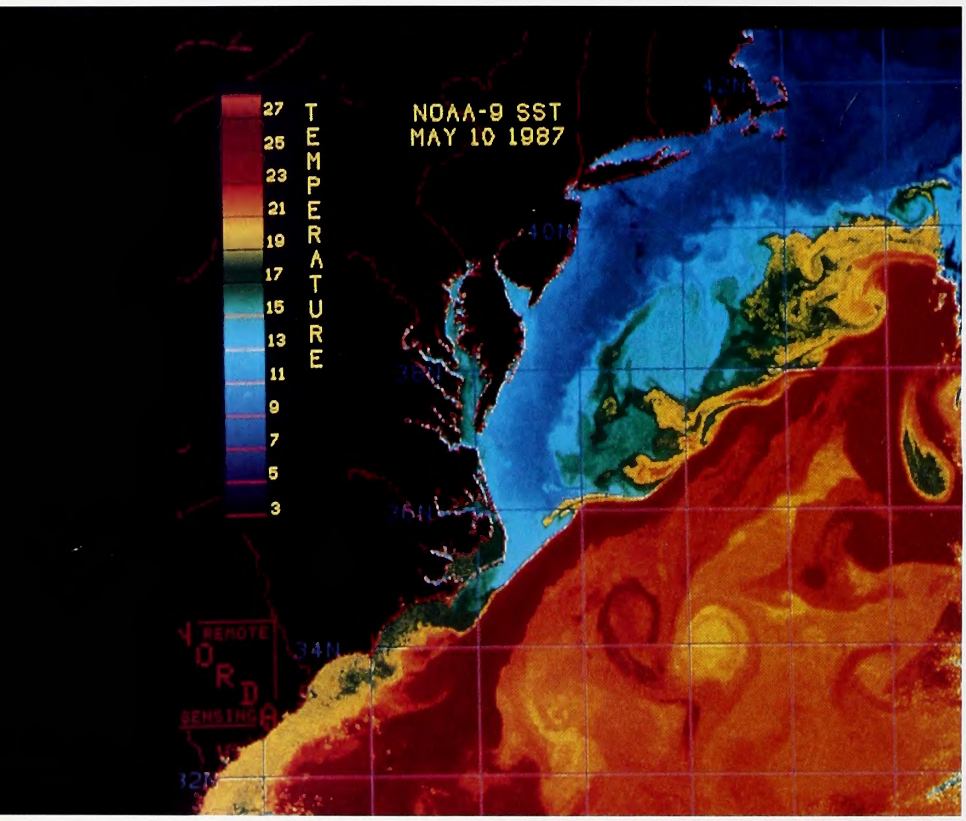
Ernest Hemingway introduced *the Gulf Stream's mystique and fabulous fishing to anyone who can read, but a day trolling (near left) for large pelagic species like marlin, sailfish, tuna or wahoo remains a dream for most. Many smaller species like these jacks (opposite page) find food and comfortable temperatures in this warm current.*

The Gulf Stream is also reported to be among the most important factors in shaping climate. Hurricanes spawned as depressions in Africa are steered along the Stream by the tradewinds to the Caribbean and North America, distributing more heat than a year of normal wind. As we shall see, the Stream also transports warm water inshore, moderating temperatures in North Carolina and other inshore waters.

North Carolina's commercial fishermen and anglers are profoundly indebted to this warm flow and to the scientists who pore over steadily accumulating data about it. Newly designed instruments can now be dropped overboard from boats or airplanes. They take

underwater measurements of light, salinity, depth, pressure and other factors and then bob to the surface to radio the data to a satellite. So much data is being gathered from this and other means that scientists can't analyze it fast enough. But slowly they are putting together a complex, multi-dimensional picture of how this most powerful and influential of ocean currents actually works.

The Stream's heat source is actually a relatively simple matter to understand. Sunlight warms the earth more at the equator than at the poles because of the angle at which the rays strike the surface and also because there is less atmospheric insulation at the equator. But this heat doesn't just stay in the equatorial regions—if it did, fish would boil off Bali. Currents distribute the heat north and south toward the poles. The Gulf Stream carries some of this warm water northward around the Sargasso Sea.



NATIONAL OCEANIC & ATMOSPHERIC ADMINISTRATION

A computer-generated *illustration based on satellite information shows the varied temperatures of water in and around the Gulf Stream as they existed off the mid-Atlantic on May 10, 1987. Eddies and offshoots of the current, some trapping colder or warmer pockets of water, can be readily seen.*

If we could measure the ocean's surface temperatures from our orbiting observation module, we would see the warm spray of the Stream with the hose nozzle at Miami aimed up the coast to Cape Hatteras and see how the flow leaves the slope environment here and slides into the deeper waters of the Atlantic. We would notice that the Gulf Stream does not follow a set "channel," but tends to meander, shifting its position, and sending out warm-water filaments—tongue-like southward extensions of the Gulf Stream—that persist for only two to three weeks and transport heat, nutrients and kinetic energy up on the shelf as close as six miles from the North Carolina coast.

As the Stream shifts shoreward or offshore, it sometimes forms rings or eddies both east and west of its axis. As a meander trough or migrating wave moves along, it may upwell cool water which can move onto the continental shelf and form an eddy. Clockwise-turning eddies move south, southwestward inside the Gulf Stream. Eddies on the east side of the Stream form rings that can trap cold or warm water and maintain their identity for months. Indeed, some of the warm-core rings on that side may be 160 nautical miles across and persist for up to a year. Warm-core rings inshore of the Stream have a life span of about half that but have the potential for transporting nutrients (and oil spills) into North Carolina territorial waters.

Even infra-red heat sensors can't reveal the whole Gulf Stream system as we orbit because, near the Grand Banks where it collides with the Labrador Current, the Gulf Stream slides under cold water blown down from the polar region. Indeed, it's impossible to appreciate this remarkable current from charts and books. To get a feel for the Stream, we must get on it and in it.

Heading southeast out of Hatteras Inlet, inshore waters might range from brown to gray-green, but as we approach the western Gulf Stream edge a sudden change occurs. Soft aquamarine goes quickly to multiple shades of blue. The blue thickens and deepens to beryl, cobalt and indigo, to blues without name or comparison. Water temperature climbs rapidly. In winter, it rarely drops below 72°F; in summer it might exceed 82°F. A big oil tanker on our course might register 20 degrees difference between bow and stern as it crosses the western wall of the Gulf Stream. From the tuna tower of a fishing boat, an angler can sometimes see 200 feet into the clear, mysterious depths.

On average, the Gulf Stream is 100 miles wide and a mile deep, but here off Cape Hatteras it might be only 50 miles across and reach to or near the bottom 300 to 1,500 feet below.

Anglers skipping baitfish cannot perceive that they are being swept northward, but the skipper can measure this drift with navigation instruments and must allow for it in setting a course home. For example, it may take 2½ hours at 20 knots for boats to cross the Florida Straits to the Bahamas, during which time they might drift north 10 miles if no compensation is made. This would be enough to miss landfall on small islands. If they have motor trouble, they'd be in the Carolinas in a few days.

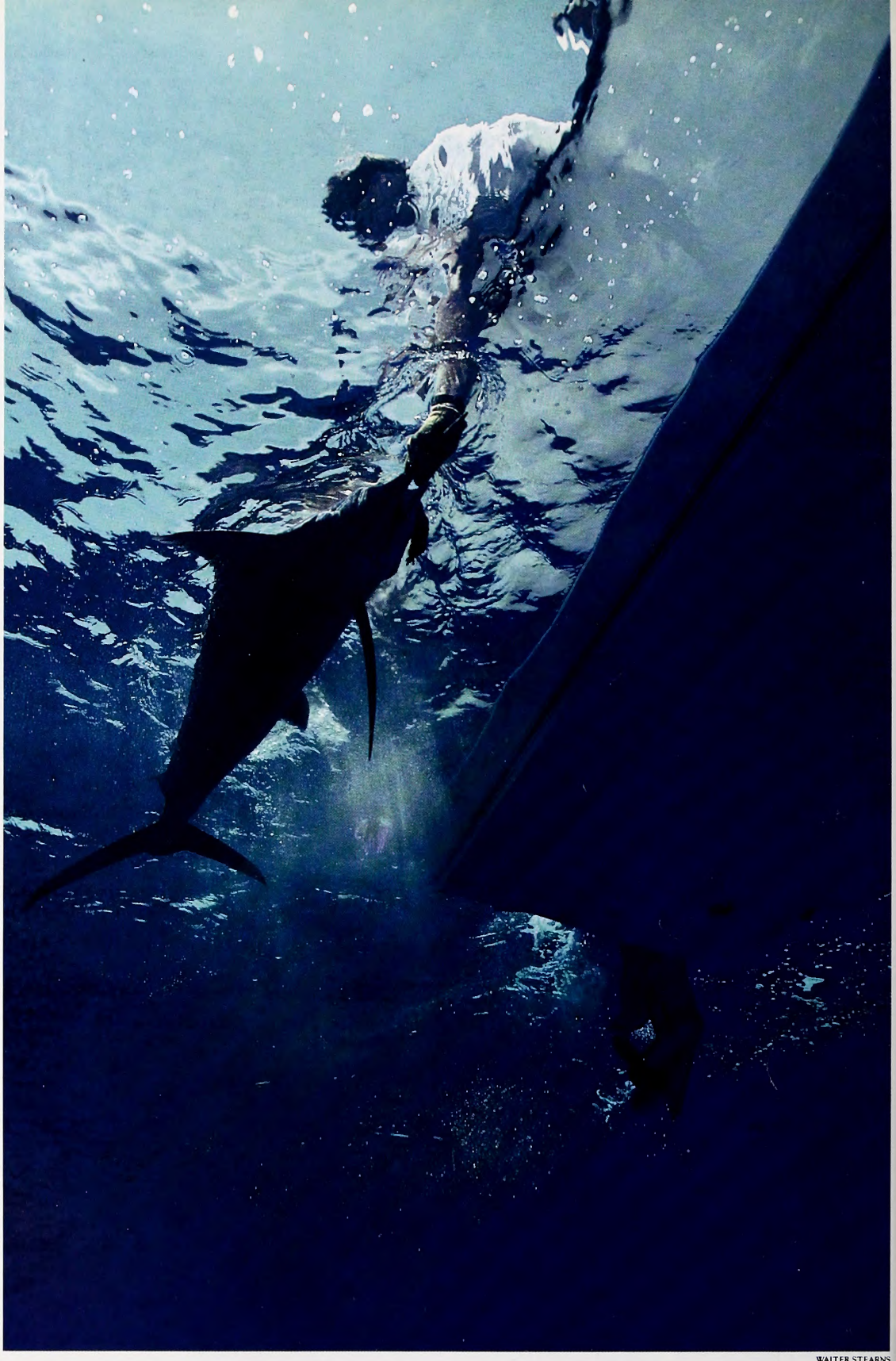
Where adjacent currents flow at different rates, weedlines form. Increasingly these days, they are debris lines, with a substantial percentage of crating and other floating trash thrown overboard or blown from ships. Weedlines often inscribe the banks of the Gulf Stream and consist mostly of sargassum weed, an alga with "berries" that serve as floats. Early sailors thought sargassum was torn from some bottom formation, but it floats free and is self sustaining. At certain times of year, another weedline component is yellow "sulphur," really blue-green alga that may form filaments or colonies, depending on the species, and which may reach concentrations of more than 10 million colonies per cubic meter. Algae are among the many, sometimes microscopic, marine vegetables—the first fruit of sunlight and the sea—which make

Gulf Stream

In the western Atlantic, *the Gulf Stream flows north passing through the Florida straits, then turns eastward farther offshore. It passes close enough to North Carolina's Outer Banks to permit anglers to reach it within a few hours. The Gulf Stream crosses the north Atlantic to Europe, where part of it turns south to pass the Canary Islands, then swings westward to complete its giant circle around the Sargasso Sea.*

ILLUSTRATION BY JIM BROWN

This angler prepares *to release a blue marlin that was taken from a relatively small boat where the Gulf Stream passes very near the coast of Florida. Off North Carolina, larger, more seaworthy sport-fishing boats are the rule because the Gulf Stream lies farther offshore.*



WALTER STEARNS

the minerals in the water available to the animals. Plankton of all kinds lie at the base of the marine food chain, fed upon largely by little animals that are themselves food for slightly larger animals, and so on up the chain to large predator fishes and man.

Divers describe hanging on a tether in the blue void of the Gulf Stream, looking at strange creatures drifting by—diverse marine bugs, predatory jellies of many kinds, pulsing and iridescent. They find serpentine windings of salps, spotted, with gold stomachs, all strung together like clear jars. Salps are planktonic herbivores, grazing the bacteria and tiny vegetables of the Stream. Capricious currents and upwellings can shift the basic nutrients to cause sudden planktonic blooms, so that salps may prosper momentarily, then fall into blight. Their fecal pellets,

rich in ammonium, serve the nitrogen needs of bottom dwellers and drifting phytoplankton. Larger and sometimes smaller animals in turn feed on salps. One of the comb jellyfishes can eat salps larger than itself. A particular shrimp species eats the salp and takes over its case for a portable nursery. Although salps are 95 percent water, Portuguese man-of-wars, other jellyfish, mollusks and other plankters feed on salps too, as do flying fish and cod, albatrosses and sea turtles.

Sargassum communities remain sources of food and cover for hitchhiking invertebrates like barnacles and anemones. Weed mats serve as traveling mid-ocean nurseries for motile invertebrates such as shrimp and varieties of sea slugs that fly like birds through the floating canopy. Near Cape Hatteras, two shrimp species, a snail and one of the filefishes, dominate weed patches. Among the more specialized creatures is the sargassum frogfish, which sports as effective a job of camouflage as nature ever achieved. Many fish species are found as juveniles under flotsam and eventually move to nearby waters of the continental shelf. Among them are jacks, halfbeaks and the flying fishes. Flying fish escape predators by flushing like quail and soaring away on spread pectoral fins. Some jellyfish, like the hazardous Portuguese man-of-war, straddle the worlds of water and air and sail aimlessly with an entourage of associated fish species.

Life is most abundant at the edges of the Gulf Stream because the water at the core is relatively infertile and therefore incapable of establishing an extensive food chain. Upwelling from the depths and runoff from the continent combine to create a more nutritious environment at the Gulf Stream edge. In winter, the top five North Carolina commercial species spawn here. Larval spot, menhaden, croaker and two species of flounder, which together make up 85 percent of this state's commercial catch, migrate to Pamlico Sound.

North Carolina's rich marine fauna and flora are due in part to a variety of available habitats. Interactions of the cold Virginia Current and the Gulf Stream produce a seasonally variable environment. Many temperate and subtropical plankton species have their southern and northern limits of distribution in North Carolina waters.

The Gulf Stream is an important highway for migrating fish, birds and marine mammals, with wide seasonal variation in abundance. Twenty-seven marine mammals occur seasonally or occasionally in North Carolina's piece of the Gulf Stream, or inshore of it, including endangered species. The sperm whale, of *Moby Dick* fame, and the blue whale, the largest mammal that has ever lived, are potential migrants through deep, offshore waters. Boaters en route to the Gulf Stream are often entertained by schools of porpoises sporting about their craft.

Several tuna species, wahoo, colorful dolphin, pugilistic white marlin and blue marlin weighing over half a ton ply these waters, just to name a few of the important fish of the upper strata.

Skipping ballyhoo with colorful skirts pulled over their heads are trolled by anglers across the surface toward violent collisions with gamefish. Big-game anglers in the tradition of Ernest Hemingway and Kip Farrington have come here in increasing numbers since World War II to ride backwards, stare at baits and engage big fish in combat. Fabulously expensive boats from makers like Hatteras, Bertram and Rybovich are built for fishing Gulf Stream waters while charter fleets serve anglers of more moderate means.

The fishing is good. Waters along the inner edge of the Gulf Stream have lately yielded some of the world's most productive angling for marlin and dolphin. Only about 21 blue marlin weighing over 1,000 pounds have ever been caught in the Atlantic Ocean, yet five of them came from Gulf Stream waters off North Carolina.

Just as it nourished Outer Banks wreckers in the age of sail, this great blue gyre continues to nourish the recreational needs of modern anglers and the economic needs of fishermen and the shipping industry. Meanwhile, scientists labor to learn the startling diversity of its life forms and get the whole picture of what is arguably the most powerful oceanic engine in the world. ⊡

BOB STEARNS

Sporting an outlandish *and effective camouflage, the sargassum fish is able to match its shape and color to sargassum weed, a free-floating plant common to the Sargasso Sea and surrounding waters. Many species are born or find shelter in this plant.*

Gulf Stream Data Service

Private firms and the National Marine Fisheries Service plot Gulf Stream temperature from satellite data. Subscription services and the National Weather Service make charts available to subscribers who receive them by mail or fax. Shipping companies, sailors and all kinds of fishermen are interested. North Carolina Sea Grant, for one, handles mail subscriptions. For more information, write N.C. Sea Grant, P.O. Box 130, Kure Beach, NC 28449, or phone (919) 458-5498.

Of Lakes and LARGEMOUTHS

Bass fishing is pretty good in most Piedmont impoundments, but even with special size restrictions and careful management, anglers shouldn't expect miracles.

by Scott Van Horn

Have you ever paused in the middle of an unproductive fishing trip and wished that all the bass in the lake would rise to the surface for an instant so you could at least be confident that fish were present? Imagine that you could go from lake to lake doing the same thing. You could quickly separate the good bass lakes from the poor bass lakes. You might even discover that some of those lakes where you haven't had much success have an encouraging number of bass in them.

Being a fish biologist and getting to sample bass populations with electricity may come as close to fulfilling that fantasy as anyone will ever get. I'm one of a number of biologists with the N.C. Wildlife Resources Commission who for years have been taking just such a "look" at North Carolina's Piedmont reservoirs from Statesville to Roanoke Rapids. And, as you would expect, we often attract the attention of fishermen.

Just recently, while we were running our electrofishing boat along a piece of shoreline at Jordan Lake near Raleigh, a pair of fishermen in a bass boat pulled in closer to watch as we conducted an annual largemouth bass sample. The water was dingy and there were schools of shad working the surface of the lake. We were picking up a lot of bass in the cover provided by an old road bed. As we shut down the generator and began recording lengths and weights from the bass we had crowded into a 75-gallon holding tank, the fishermen pulled closer.

"Yes," they said, they had caught a few fish that day, "but none off this old road bed." I returned the last of many large bass to the water and we headed for our next sample location. A couple of crankbaits hit the water adjacent to the road bed as we moved out of range.

Earlier in the week we had been on a smaller, clearer water supply reservoir farther up the Cape Fear basin and similar watchers had followed us. The fishermen had caught a few small bass and hoped to catch sight of a big fish being netted by the electrofishing boat. This lake seems to yield lots of small bass, but few fish larger than 14 inches. That day was no exception. We caught lots of small fish but nothing that held our audience's attention. Soon they drifted off, probably thinking they should have gone elsewhere.

Indeed, I think there is an unwritten rule that the best bass fishing lakes must be the farthest from an angler's home. One thing is certain. Electrofishing reinforces what anglers already know — not all bass lakes are created equal, and that seems especially true of the large impoundments of the Piedmont mid-section of the state. The trick is figuring out why this is so. Equally important is knowing what, if anything, can be done to improve prospects in those lakes that consistently yield only fair fishing.

Understanding some of the important features that determine fish production in reservoirs removes some of the mystery. It turns out that among other things, the quality of your bass fishing, especially on Piedmont reservoirs, is related to very old geological events. An important and widespread geological feature present throughout much of central North Carolina is red clay. This clay is highly erodible and makes little contribution to the productivity of the overlying water when submerged. Clay even shows a tendency to capture and remove nutrients which might be helpful in producing fish.

In many Piedmont reservoirs, the bottom is largely made up of clay. While there is less structure and cover than in lakes in other parts of the country, Jordan Lake provides a typical lesson in how clay bottoms change fishing. While under construction, the lake

KEN TAYLOR

***Bass fishermen** who spend a lot of time fishing Piedmont lakes learn to contend with muddy water, especially in the spring (left). Sunlight can't penetrate muddy water, however, so the growth of small plants and animals is inhibited. This is but one reason these mid-state lakes don't produce as many largemouth bass (right) as some lakes elsewhere.*

KEN TAYLOR

***District fisheries** biologist Shari Bryant runs an electro-shock boat along the shore at Jordan Lake while assistant biologist Brad Hammers mans the dip net. The electric current temporarily stuns the fish, permitting biologists to evaluate the population and health of various species. Such surveys reveal that many Piedmont lakes have limited capabilities to produce good bass fishing.*

bottom was cleared of all vegetation except for a few areas where standing trees were left. The courts and some untimely repairs gave nature a chance to completely recover the bottom in a dense underbrush. When the gates finally closed on the dam, the flooded brush provided unlimited cover to large swarms of small fast-growing bass. For several years, it was hard not to be a successful shoreline plugger. The numbers of bass inevitably declined as the fish got older and the brush decayed and disappeared. Productive, brushy shorelines gave way to barren clay flats. At Jordan, like most Piedmont reservoirs, the majority of the structure soon became located in smaller areas, and anglers were forced to change their tactics.

Our ancestors also pre-shaped our bass fishing experience on these Piedmont lakes. Many of our great-great grandads thought that the natural richness of this land was inexhaustible. One common approach to agriculture was to clear the land, plant until the soil was lost to erosion or the nutrients depleted, and then move a little farther to the west and begin the whole cycle again. The same nutrients that are important for growing an acre of corn in soil are important for growing fish in a reservoir. Nutrients are released into the water from underlying soil as a reservoir is formed. Poor farming practices in the 19th and early 20th centuries reduced the amount of nutrients in our soils and consequently may have helped to set limits on how many pounds of bass an acre of reservoir water will grow today.

Land-use patterns continue to be important today. Soil erosion, while much reduced from earlier times, continues to have an impact on reservoirs. Many Piedmont lakes quickly become turbid following heavy rains and may stay turbid for most of the spring months. Heavy turbidity shades reservoir bottoms and prevents the growth of aquatic plants. While much money and effort is expended in controlling nuisance aquatic plants around the country, it is also true that some types of weeds can have a beneficial effect on bass fishing. Anglers on the Yadkin lakes or at Lake Gaston know that the emergent water willow beds along the shorelines of those reservoirs are excellent places to find fish, especially in the spring. However, most of the large, mainstream reservoirs in the Piedmont have few or no submerged aquatic plants.

Another feature of Piedmont reservoirs is the role that point-source discharges play in determining their ability to produce fish. Because the natural fertility of these reservoirs is often low, upstream discharges of nutrients created by man's activity can sometimes actually promote fish production. The

Big Game Tag Report - Number 15

...a summary of North Carolina's big game harvest for 1990-91 as reported by hunters to Wildlife Cooperator Agents

Why should a hunter go out of his way to tag and report the turkey gobbler he just shot? How many deer were harvested during the season here in North Carolina? Was the total deer harvest for this period greater or less than this figure for last season? How is this information used? These are questions that often surface during discussions of North Carolina's big game tagging system. The big game tagging system is a reporting procedure which requires that all wild turkey, boar, bear and deer which are harvested by hunters here in the state be tagged at the site of harvest and that certain information be reported to any one of approximately 1,500 Wildlife Cooperator Agents for later collection by the Wildlife Resources Commission. This procedure became mandatory in the fall of 1976. Successful game management is based on many factors and individual pieces of information, including in this case, big game harvest figures. The more a game manager knows about population trends and numbers, the easier it is for him to make decisions affecting seasons or other regulatory matters. Sound big game management must be the result of the combined efforts of sportsmen and the staff of the Wildlife Commission. While the figures in this report represent the reported harvest and may vary from the actual harvest, they are the best such figures available at this time. Please do your share to see that future reports of this nature are as complete as possible by tagging and reporting your big game harvests and by encouraging your fellow sportsmen to do the same.

If you have questions about the procedures or this report, please contact the Division of Wildlife Management, North Carolina Wildlife Resources Commission, 512 N. Salisbury Street, Archdale Building, Raleigh, North Carolina 27611.

1990-91 Reported Black Bear Harvest

County	Male	Female	Total	Game Land	Other Land	Rifle	Shot Gun	Hand Gun	Bow
Ashe		1	1	1		1			
Avery	1	1	2	2		1		1	
Beaufort	34	24	58		58	57	1		
Bertie	7	10	17		17	14	2		1
Bladen	19	19	38	4	34	27	11		
Brunswick	6	4	10		10	6	4		
Buncombe	8	11	19	5	14	18	1		
Burke	4	1	5	3	2	4			1
Caldwell	7	3	10	7	3	6		3	1
Camden	14	13	27		27	20	7		
Carteret	13	6	19	5	14	15	3	1	
Cherokee	31	12	43	41	2	27	14	2	
Clay	11	10	21	16	5	15	1	5	
Columbus	4	6	10		10	7	3		
Craven	9	6	15	3	12	14	1		
Cumberland	1		1		1		1		
Duplin	2	1	3		3	1	1	1	
Gates	12	10	22		22	12	9	1	
Graham	18	11	29	27	2	25	4		
Haywood	19	19	38	22	16	38			
Henderson	3	4	7		7	7			
Hyde	31	22	53		53	53			
Jackson	12	2	14	10	4	14			
Jones	28	12	40	10	30	39	1		
Macon	10	10	20	18	2	18		1	1
Madison	11	12	23	18	5	19	1	3	
McDowell	13	19	32	21	11	20	9	3	
Mitchell	3		3	1	2	3			
Onslow	21	7	28		28	21	7		
Pamlico	5	6	11		11	11			
Pasquotank	6	1	7		7		7		
Pender	10	9	19	1	18	14	3	1	1
Rutherford	1		1		1	1			
Sampson	1	2	3		3	2		1	
Swain	8	2	10	6	4	5	4	1	
Transylvania	6	1	7	6	1	7			
Tyrrell	22	15	37		37	33	3	1	
Washington	19	15	34		34	34			
Watauga	2		2	1	1	1			1
Wilkes	1		1	1		1			
Yancey	19	9	28	7	21	16	8	1	3
Totals	452	316	768	236	532	631	106	26	9

1990-91 Reported White-Tailed Deer Harvest

County	Sex Harvested				Antlered Bucks Per Sq. Mile	Weapon					Location	
	Antlered Bucks	Button Bucks	Does	Total		Shotgun	Rifle	Muzzle-Loader	Bow	Hand-gun	Game Lands	Other Lands
Alamance	560	46	157	763	2.93	84	485	130	61	1		763
Alexander	231	13	62	306	1.38	13	165	57	70			306
Alleghany	752	65	231	1,048	6.21	17	567	252	208	1		1,048
Anson	1,183	214	763	2,160	3.35	352	1,390	243	136	7	27	2,133
Ashe	689	79	251	1,019	2.82	9	531	305	164	6	4	1,015
Avery	69	4	9	82	0.38	3	59	5	14		57	25
Beaufort	1,565	214	1,132	2,911	3.08	213	2,454	114	53	7	21	2,890
Bertie	1,599	326	1,375	3,300	3.24	1,947	1,173	62	45	6	50	3,250
Bladen	2,587	360	1,895	4,842	3.95	2,758	1,806	117	64	10	100	4,742
Brunswick	1,765	225	1,040	3,030	2.78	2,197	657	92	37	8	49	2,981
Buncombe	167	29	168	364	0.39	6	317	9	23	1	78	286
Burke	727	82	255	1,064	1.88	25	770	96	159	5	218	846
Cabarrus	81	2	10	93	0.53	61	3	11	17	1		93
Caldwell	432	24	107	563	1.21	16	428	36	78	3	151	412
Camden	222	18	49	289	1.60	129	148	6	4			289
Carteret	459	12	136	607	1.69	206	330	38	9	5	87	520
Caswell	1,305	243	704	2,252	5.00	728	980	339	180	10	193	2,059
Catawba	215	12	53	280	1.34	16	144	60	48		3	277
Chatham	1,644	158	662	2,464	3.49	212	1,410	444	372	8	374	2,090
Cherokee	22			22	0.06	1	20	1			14	8
Chowan	470	52	227	749	5.60	222	438	48	24	1		749
Clay	61		2	63	0.35	1	57	1	4		48	15
Cleveland	255	9	38	302	1.23	12	234	13	28	4	8	294
Columbus	2,081	186	1,115	3,382	3.15	2,045	1,072	110	41	3		3,382
Craven	1,577	139	805	2,521	3.14	382	1,864	140	61	5	133	2,388
Cumberland	789	103	487	1,379	2.16	238	1,003	50	74			1,379
Currituck	439	26	129	594	4.35	168	385	13	17	2	4	590
Dare	61	5	18	84	0.24	21	17	23	21	1	51	33
Davidson	624	82	282	988	2.41	35	688	148	106	1	26	962
Davie	416	43	141	600	3.75	25	366	106	91	5		600
Duplin	1,271	121	572	1,964	2.79	729	1,123	36	31	9	8	1,956
Durham	240	27	71	338	1.57	133	138	36	27	1	132	206
Edgecombe	1,577	289	1,157	3,023	6.77	1,069	1,667	92	97	16		3,023
Forsyth	47	1	6	54	0.34	3	35	8	8			54
Franklin	1,051	120	338	1,509	3.77	846	508	61	49	6	20	1,489
Gaston	48	1	5	54	0.28	3	27	13	10			54
Gates	1,111	350	1,130	2,591	4.59	2,031	425	35	25	26	28	2,563
Graham	33		1	34	0.12	1	32		1		23	11
Granville	1,406	122	479	2,007	4.27	514	1,028	274	165	8	174	1,833
Greene	251	1	15	267	2.06	74	172	7	5	3		267
Guilford	280	26	63	369	1.14	73	204	35	45	3		369
Halifax	1,813	419	1,683	3,915	4.11	1,217	2,365	142	62	15		3,915
Harnett	260	11	49	320	0.74	153	116	15	28			320
Haywood	190	23	104	317	0.46	6	259	5	43		287	30
Henderson	184	9	36	229	0.81	13	174	3	24		116	113
Hertford	608	126	402	1,136	2.64	774	321	17	5			1,136
Hoke	150	3	17	170	0.59	124	33	4	8			170
Hyde	897	149	625	1,671	2.44	338	1,018	165	107	12	42	1,629
Iredell	594	52	174	820	2.39	37	472	171	128		3	817
Jackson	15		1	16	0.04	1	13		1		15	1

1990-91 Reported White-Tailed Deer Harvest

County	Sex Harvested				Antlered Bucks Per Sq. Mile	Weapon					Location	
	Antlered Bucks	Button Bucks	Does	Total		Shotgun	Rifle	Muzzle-Loader	Bow	Hand-gun	Game Lands	Other Lands
Johnston	491	27	137	655	1.31	106	469	25	41	4		655
Jones	1,366	144	891	2,401	3.83	269	1,991	62	33	3	119	2,282
Lee	255	14	63	332	1.51	37	214	39	36	1	13	319
Lenoir	525	42	248	815	2.68	97	685	9	14	1	1	814
Lincoln	101	3	2	106	0.70	13	65	14	12	1		106
Macon	129	5	13	147	0.29	6	116	3	22		123	24
Madison	152	4	64	220	0.45	5	173	4	35		128	92
Martin	946	110	646	1,702	3.45	966	628	32	18	3	6	1,696
McDowell	380	25	127	532	1.05	20	329	45	120	1	210	322
Mecklenburg	53	12	31	96	0.23	58		21	16			96
Mitchell	224	8	41	273	1.38	2	170	19	79		60	213
Montgomery	1,632	278	879	2,789	4.17	226	1,671	498	346	9	349	2,440
Moore	427	36	138	601	0.82	387	145	34	25		12	589
Nash	457	57	128	642	1.62	279	318	16	16	2		642
New Hanover	86	7	54	147	1.10	70	68	5	3		1	146
Northampton	2,166	542	1,962	4,670	6.56	2,179	2,182	115	58	11		4,670
Onslow	1,704	250	1,117	3,071	3.17	1,671	1,085	84	129	8	39	3,032
Orange	651	52	215	918	2.89	192	483	146	83	8		918
Pamlico	505	26	172	703	2.42	35	618	25	12	3	8	695
Pasquotank	213	14	56	283	2.73	114	156	3				283
Pender	1,782	197	1,111	3,090	2.48	1,306	1,534	100	66	15	85	3,005
Perquimans	551	61	436	1,048	4.63	373	630	11	11	3		1,048
Person	797	77	283	1,157	3.69	349	575	158	52	6	45	1,112
Pitt	1,086	119	606	1,811	3.34	225	1,464	44	20	11		1,811
Polk	241	20	87	348	1.35	3	297	5	35	1	141	207
Randolph	623	70	220	913	1.31	76	568	133	126	1	44	869
Richmond	736	86	336	1,158	1.98	602	444	55	39	5	49	1,109
Robeson	490	58	244	792	1.12	431	246	16	21	3	3	789
Rockingham	800	65	251	1,116	2.64	128	656	134	179	7		1,116
Rowan	504	65	212	781	2.26	53	534	82	106	2	32	749
Rutherford	705	28	136	869	1.76	30	676	57	94		43	826
Sampson	1,127	133	693	1,953	2.13	776	1,013	52	45	8		1,953
Scotland	442	35	193	670	2.30	446	165	21	28		97	573
Stanly	635	78	293	1,006	3.87	137	593	107	155	7	8	998
Stokes	305	10	61	376	1.15	44	207	47	74	2	4	372
Surry	308	19	63	390	1.13	19	258	58	52	1		390
Swain	33	2		35	0.07	2	27		5	1	18	17
Transylvania	250	10	45	305	0.76	7	266	2	20		228	77
Tyrrell	256	12	65	333	1.07	29	256	29	10	1	3	330
Union	149	1	4	154	0.56	10	122	9	10			154
Vance	456	26	104	586	3.28	176	341	26	25	2	10	576
Wake	404	17	67	488	0.91	92	323	40	29	2	112	376
Warren	1,112	204	729	2,045	3.74	1,247	674	39	9	6		2,045
Washington	514	50	259	823	3.54	108	568	69	60	1	1	822
Watauga	97	2	14	113	0.52		73	13	26	1	1	112
Wayne	175	23	65	263	0.77	29	194	15	15	1		263
Wilkes	1,078	73	271	1,422	1.95	20	904	238	245	3	82	1,340
Wilson	67	1	7	75	0.43	24	48	1	1			75
Yadkin	326	5	26	357	2.40	17	226	55	57		4	353
Yancey	313	33	105	451	1.22		216	38	187		152	299
State Total	63,898	7,857	33,201	104,956	2.16	33,772	55,755	7,041	5,978	345	4,775	100,181

1990-91 Reported Wild Boar Harvest

County	Male	Female	Total	Game Land	Other Land	Rifle	Shot Gun	Hand Gun	Bow	Unknown
Buncombe	1		1	1					1	
Burke	1	1	2		2	1			1	
Caldwell		1	1		1				1	
Cherokee	15	16	31	28	3	22	6	2		1
Clay	9	2	11	11		7		3		1
Graham	17	25	42	38	4	37	2	2		1
Macon	10	6	16	12	4	13			3	
McDowell		1	1	1			1			
Swain	3	2	5	4	1	5				
Totals	56	54	110	95	15	85	9	7	6	3

1990 Reported Wild Turkey Harvest

	Age				Location			Weapon Used			
County	Adult	Juvenile	Unk.	Total Reported	Game Land	Other Land	Unk. Land	Shotgun	Bow	Muzzle	Unk.
Alamance	30	2		32		32		29			3
Alleghany	65	48		113		113		105	1		7
Anson	18	2		20		19	1	19			1
Ashe	120	44	9	173	6	158	9	170			3
Bertie	79	10		89	1	77	11	81			8
Brunswick	3			3		3		3			
Buncombe	16	11		27	10	16	1	23			4
Burke	1			1	1			1			
Caldwell	1			1		1		1			
Caswell	215	44	3	262	33	217	12	255			7
Chatham	10	3		13	3	8	2	13			
Cherokee	56	5		61	50	8	3	54			7
Chowan		1		1		1		1			
Clay	19		1	20	16	4		18		1	1
Craven	3			3	3			3			
Durham	6			6		6		6			
Graham	33			33	24	6	3	28			5
Granville	34			34	5	27	2	33	1		
Halifax	22	7		29	2	26	1	28			1
Haywood	5			5	3		2	4			1
Henderson	15	6		21	13	7	1	21			
Hyde	3	1		4		4		4			
Jackson	25			25	19	5	1	25			
Johnston	6			6		6		6			
Macon	64	3		67	54	9	4	65			2
Madison	24	2		26	18	6	2	23			3
Martin	22	5		27		27		25			2
McDowell	14	1		15	11	3	1	15			
Mitchell	11	2		13	11	2		13			
Montgomery	12	5		17	3	14		17			
Moore	1			1	1			1			
Northampton	17	2		19		19		19			
Onslow	12	1	2	15		15		15			
Orange	24	2		26		18	8	26			
Pender	8			8		8		7			1
Person	80	18		98	6	84	8	88			10
Richmond	37	4		41	5	34	2	41			
Robeson	2			2		2		2			
Rockingham	38	1		39		39		38			1
Scotland	4			4	1	3		4			
Surry	22	5		27		27		23			4
Swain	16	1		17	8	9		16			1
Transylvania	27	2		29	18	9	2	26			3
Watauga	24	4	2	30	1	26	3	28			2
Wilkes	14	12		26	4	20	2	24			2
Yancey	3	1	1	5	2	3		5			
Totals	1,261	255	18	1,534	332	1,121	81	1,452	2	1	79

Previous Five Years Harvests: 1985-509; 1986-540; 1987-680; 1988-1,032; and 1989-1,275

ancient Chinese recognized this fact and used it in their aquaculture practices. Animal wastes were added to their culture ponds and even the "outhouse" was often located near the water. Unless too many nutrients are added, this influx of organic material can stimulate fish growth. There is, of course, a difference between potentially beneficial nutrients and organic material and dangerous, unwanted forms of pollution such as heavy metals or pesticide contaminants. It is ironic, however, that efforts to eliminate some forms of river pollution may actually lower fish production in downstream reservoirs.

Finally, anglers themselves affect bass fishing. The Piedmont is heavily urbanized and has the fastest growing population in the state. The 1980 census found there were 160 people per square mile in the region, and growth has continued since that census was taken. Average income in the state is highest in this area, which also means more money for boats, tackle and bait. Many central North Carolinians fish, and much of that fishing takes place on Piedmont reservoirs.

Biologists once thought that fishing pressure had little impact on fish populations, but studies have disproven this belief. Indeed, heavy fishing pressure on reservoirs that already have limited capability to produce fish can reduce the number of large, older fish. On large reservoirs where bass growth is good and there are few fish older than 5 years and larger than 16 inches, overfishing may be the culprit. In its most severe form, overfishing may reduce the total poundage of bass present in a lake. On Piedmont reservoirs, we have witnessed examples of the former but have little evidence of the latter.

Geology, land-use practices then and today, and fishing pressure all play a role in setting the bounds on the quality of bass fishing from reservoir to reservoir. It is the fishery biologist's job to manage the bass populations within these constraints. As yet, managers can do little about the total weight of fish each reservoir will support because much of this was predetermined ages ago. Therefore, biologists must try to manage the quality of that production through size and creel limits.

But what is a "quality" bass fishery? For many anglers, it is measured in how many large bass they can catch and release in a trip. Other anglers may find value in the number of fish they can catch and take home, regardless of size. Unfortunately, these two attitudes are not compatible. Furthermore, given intense fishing pressure, it's virtually impossible to provide both large size and high numbers of bass in a reservoir over a long period. In combination, these factors have given rise to the use of several kinds of size and creel limits.

In an effort to try to provide the kind of quality bass fishing anglers want, there are currently seven different bass size and creel limits in effect on various Piedmont reservoirs. In some cases, these different regulations attempt to take into account the differences in the productivity of the various lakes. The basic regulation in effect on most lakes protects the bass population from indiscriminate harvest but does not protect large fish. Within the Piedmont, for example, the general regulation permits a creel limit of five fish. The minimum size limit is 14 inches, but two fish smaller than the size limit can be kept per day.

DEBORAH CONGER

Too few nutrients, *too much red clay, not enough cover — all limit the size and numbers of bass in many Piedmont lakes. Combined with historically poor land practices and heavy fishing pressure, this means anglers should not expect the fishing in these lakes to match more productive waters.*

There are, however, slot limit regulations that are designed to protect and produce large bass. These regulations allow some harvest of small bass and are usually used on lakes that produce large numbers of young fish. Slot limits are currently found on Tuckertown, Falls of the Neuse and Sutton reservoirs. These lakes have a five fish creel limit, but no fish between 12 and 16 inches can be kept. Only two fish can be smaller than 12 inches. A recently completed evaluation of this slot limit shows that it's working at Tuckertown and Falls of the Neuse where the number of fish above 16 inches has increased. The study is not complete at Sutton.

Large minimum-size limits are designed to protect and produce large fish where the number of young bass produced each year is low or the food available is excellent and growth is not damaged by increasing the numbers of large fish. Bass fishing at Jordan Lake near Raleigh and Thom-A-Lex Lake below Thomasville are examples of fisheries management that employs large minimum size limits. No fish smaller than 16 inches on Jordan or 18 inches on Thom-A-Lex can be kept.

Studies show that on newly opened, small reservoirs, a whopping 50 to 80 percent of *all* the harvestable bass can be caught — and often are — within a few weeks. Because of this, the Wildlife Commission is experimenting with a fish-for-fun, no-harvest regulation on one small city water-supply reservoir in the Piedmont. A large minimum-size limit would also protect these bass in small, newly opened lakes.

If it seems that keeping up with bass-fishing regulations has gotten more complicated, it's simply an effort to meet the needs of today's anglers in reservoirs that historically have limited capabilities. These lakes can still provide good fishing if anglers do their part by complying with size and creel limits.

Finally, if you don't really want to keep fish to eat, you can also help by carefully releasing the bass you catch. Catch-and-release fishing has caught on widely among bass anglers, and it certainly helps. A bass safely released today can be caught again another day when it will almost surely be bigger. ☐

The author wishes to acknowledge the substantial contributions to this article of Larry Olmstead and his staff at Duke Power Co.

Life at the Bottom

Coastal headboat fishermen have long sought snapper, grouper and other bottom-dwelling fish, but all is not well with this important fishery.

written and photographed by Joel Arrington © 1991

Swells from the southwest greet the *Carolina Princess* before dawn not far out of Beaufort Inlet. For 40 sleepy passengers in the lounge, dozing curled on a bench or chatting quietly, the sea builds the farther offshore we run. This roller-coaster swell, together with high winds and accelerating currents, will cause discomfort for most of us aboard and make fishing difficult. The *Carolina Princess* nevertheless lopes southeastward, quartering the seas for miles before the sun, bigger than I had ever seen it, ascends through the horizon and casts a golden streak across the ocean's gray and heaving surface.

Even earlier in the pewter glow before dawn, seabirds had wheeled and soared over the dark Atlantic. Gulls and gannets, petrels and terns signal the richness of these watery prairies. I have often wondered if they can catch a nap in flight.

Soon after sunup, eager passengers crowd forward to lean over the rail and view porpoises playfully escorting us offshore. Apparently they race ahead of ships for no more useful purpose than to have a little fun, like dogs chasing a car.

Headboat fishing off the North Carolina coast — still the best in the country, but ailing — remains a practical alternative to the high cost of charters. Anglers fish the bottom with bait on headboats, while trolling is the rule on chartered craft on which the rate is fixed for one to six passengers. A charter trip to the Gulf Stream runs $750 to over $850 these days (plus crew's tip); however, customers on headboats, also called "partyboats," pay "by the head" $20 to over $100 per trip, depending on its length. Most summer daytrips are about $40.

Headboat fishing exploits areas of rough bottom — what marine geologists are calling "hardbottom" and "live bottom" — where fish communities congregate. Fish species inhabiting such colonies are diverse, but of particular interest to anglers are a half dozen types of groupers, five porgies, three species of snappers, two sea basses, triggerfish, various grunts, hogfish and a few other less common reef fish.

The commercial and recreational catch off this coast is a function both of how much favorable bottom we have in fishable depth and of how often our boats can get at it. Storms and high winds limit the number of fishing days. Bottom-fishing locations off Florida and in the Caribbean, where weather remains good for more days per year, have been fished nearly clean. However, those off the Carolinas remain relatively productive for some species, like vermilion snapper, grunts and porgies, although their average size is down. No doubt one of the reasons North Carolina's stocks have held up as well as they have is that the severity of our weather protects fish. But according to Dr. Gene

***Anglers lining the** rail of the* Carolina Princess *(left) never really know what might bite next, and that's part of the attraction. Headboats like the* Crystal Dawn *(above), out of Nags Head, offer an affordable opportunity to fish offshore.*

Huntsman, fisheries biologist with the National Marine Fisheries Service (NMFS), high-level predator species — red snapper, Warsaw, gag and snowy grouper, scamp and speckled hind, and some other slow-growing species — have declined in both number and average size.

Fishery managers would point out, however, that trusting mostly natural controls has led to over-exploited bottomfish populations. Sharp declines in the 1970s resulted in catch restrictions imposed in 1983 on important species. (Red and Nassau grouper, yellow-tail and red snapper were limited to a minimum 12 inches total length, black sea bass to 8 inches). A ban on trawls, which damage bottom formations on which these species depend, went into effect in 1988.

Anglers and commercial fishermen, however, continued to report declines in abundance and average size of many grouper and snapper species. In 1989 a team of scientists was asked to make recommendations to the South Atlantic Fisheries Management Council (SAFMC). Dr. Charles S. Manooch, a research chief with NMFS, said that his group looked at a variety of measures to protect threatened species, including larger size limits and "bottomfish refuge" — restricted fishing zones. The N.C. Division of Marine Fisheries, leading the way in 1991, implemented 20-inch minimum-length requirements on gag and black grouper in state waters.

Last March, after a series of public hearings, the SAFMC rejected the idea of fish refuges, but further tightened minimum size and creel limits, and required all fishermen to leave heads and fins on fish so that they could be identified. Other protection measures were sharply tightened. The new rules, if approved by the Secretary of Commerce, will go into effect January 1, 1992.

Headboats run out of sportfishing ports from Carolina Beach to Oregon Inlet. Some fish only inshore waters around the inlets, outside a few miles and in the sounds. They pursue spot, croaker, sea trout, flounder, bluefish and other species, usually on a half-day trip costing about $20. Other headboats run farther offshore, perhaps to a wreck or ledge. Several Tar Heel boats journey to the edge of the continental shelf 50 or more miles from the beach to catch tropical bottom species. Anglers resign themselves to sometimes six hours of streaming to get four hours of fishing on a long daytrip.

The season runs from April through October, though the *Carolina Princess* at Morehead City offers occasional long trips through the winter when weather permits. The price for a day excursion currently runs about $40, with bait and tackle furnished, overnight trips about $100.

On a February excursion on the *Carolina Princess*, the customers could choose their position on the rail in the same order they paid for their trip. Before dawn, with the ship still at the dock and the smell of tobacco smoke and fried sausage infusing the boat, a mate called out names and the customer came forward to receive a strip of tape, like an award, which he tied around the rail where he wanted to fish that day. Some like the bow, some the stern, others are indifferent. Anglers who like to troll while the ship moves to a different location must station themselves at the stern. Such tactics can produce king and Spanish mackerel and sometimes dolphin, wahoo, amberjack and sailfish.

On every blue-water headboat trip, some of the customers will be veterans of many missions. They likely will have developed special skills that will ensure that they exceed the average catch by a substantial margin. While a headboat crewman will tell you that anyone can catch a big grouper — and he would be right — experts generally catch far more than just chance alone would dictate or the average customer can manage.

An angler who drags a heavy electric reel aboard, with its even heavier auto battery, is serious about grouper fishing. Manually operated fishing tackle is effective only to about 150-foot depth. Electric reels extend that perhaps another 200 feet — beyond that, only commercial equipment is feasible. (Commercial operations may fish hook-and-line vertically, or lay out a long-line deep, with many droppers.) Some even bring their own bait, although crewmen tell me that customers only bring more of what the boat provides. "You'll go home with more pounds of fish if you use cut bait rather than whole bait," said one seasoned hand.

Several successful grouper specialists told me that those species want a big bait, which most headboats provide. Punctilious anglers sometimes bring their own frozen cigar minnows, or they may prepare a small bottom fish they catch offshore and send it back down. Bait preparation is second in importance, one expert told me, to the angler's ability to feel the fish and visualize what is going on below while currents run hard and the boat swings on its anchor line.

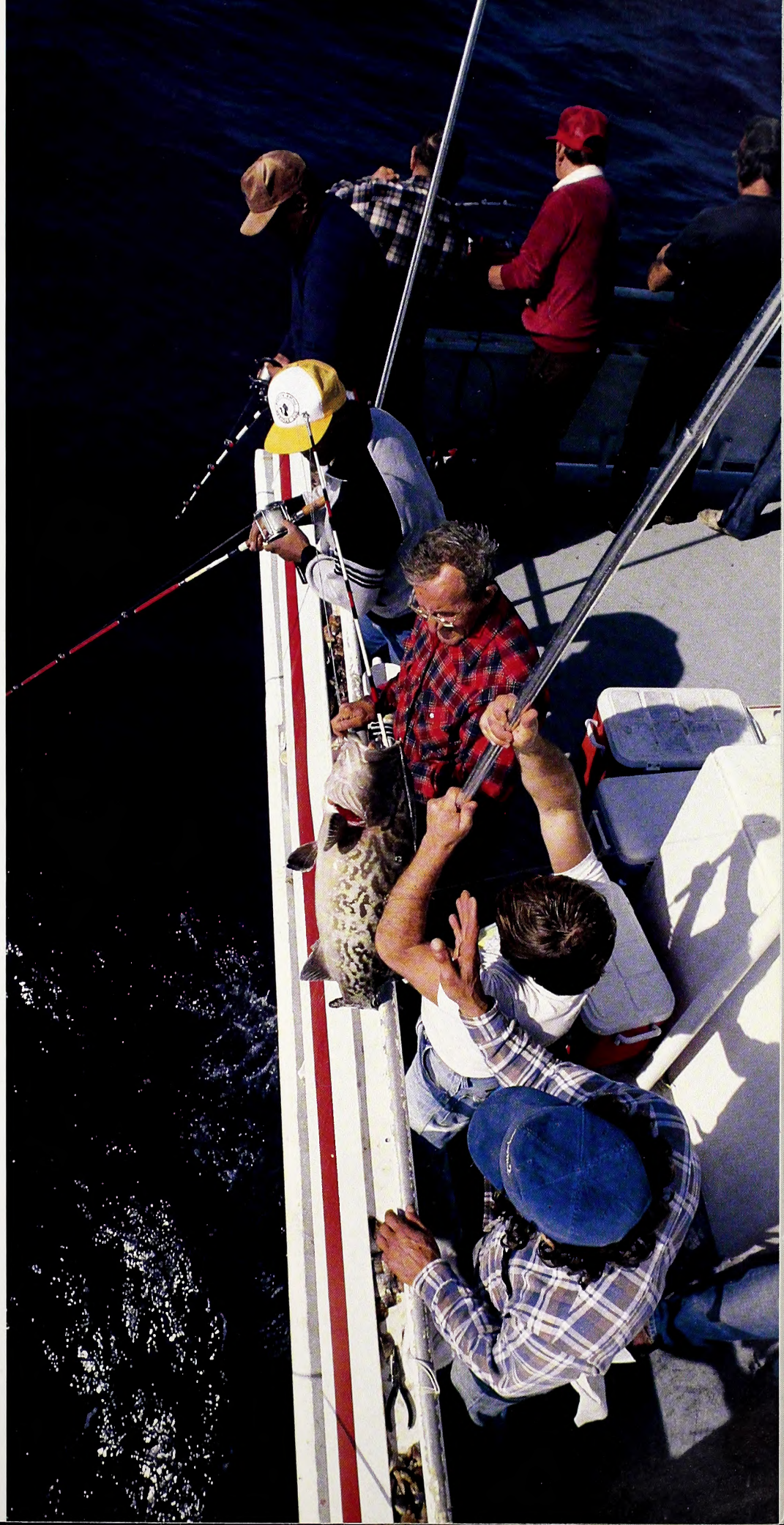
"You drop a big bait," one champion said, "and it might sit there 15 minutes, nibbled by little stuff. Then a big grouper might come along and spook the small fish. When you feel them stop nibbling, you'd better get ready. But a grouper can take a bait real gently, so most people can't feel them in the current. Once you learn how to do it, then groupers are easier to catch, but always a challenge."

Many anglers nowadays are happy to catch a gag grouper weighing 5 to 6 pounds. New to offshore fishing, they don't know that just 15 years ago, the size was near 18 pounds. "Annual changes have been subtle," Manooch said. "People seem to be satisfied with their catches, but they just aren't aware of how good fishing used to be not so very long ago."

Bottomfish have another perplexing characteristic in common with other fish species in fresh and salt water: they will quit biting altogether for no apparent reason. Jimmy Harker, captain of the *Carolina Princess*, said that 40 of his customers will often catch just as many fish as 90.

"They catch all that are going to bite," he said, "and no more. We can see plenty of fish below with our fathometers, but when the anglers catch a certain number, the rest of the

Off North Carolina's coast, *fishing pressure is affecting populations of many resident bottom-feeding fish found at popular reefs, rocks and wrecks, and the average size of species like this vermilion snapper (left) and the grouper just landed by this angler (right) has dropped markedly. The decline in the average size of fish is most noticeable to anglers who've been fishing since the 1970s. Weather and distance have provided some protection to bottom fish populations off North Carolina, but many popular spots off Florida have been virtually picked clean. Refuge areas could help prevent a similar fate here.*



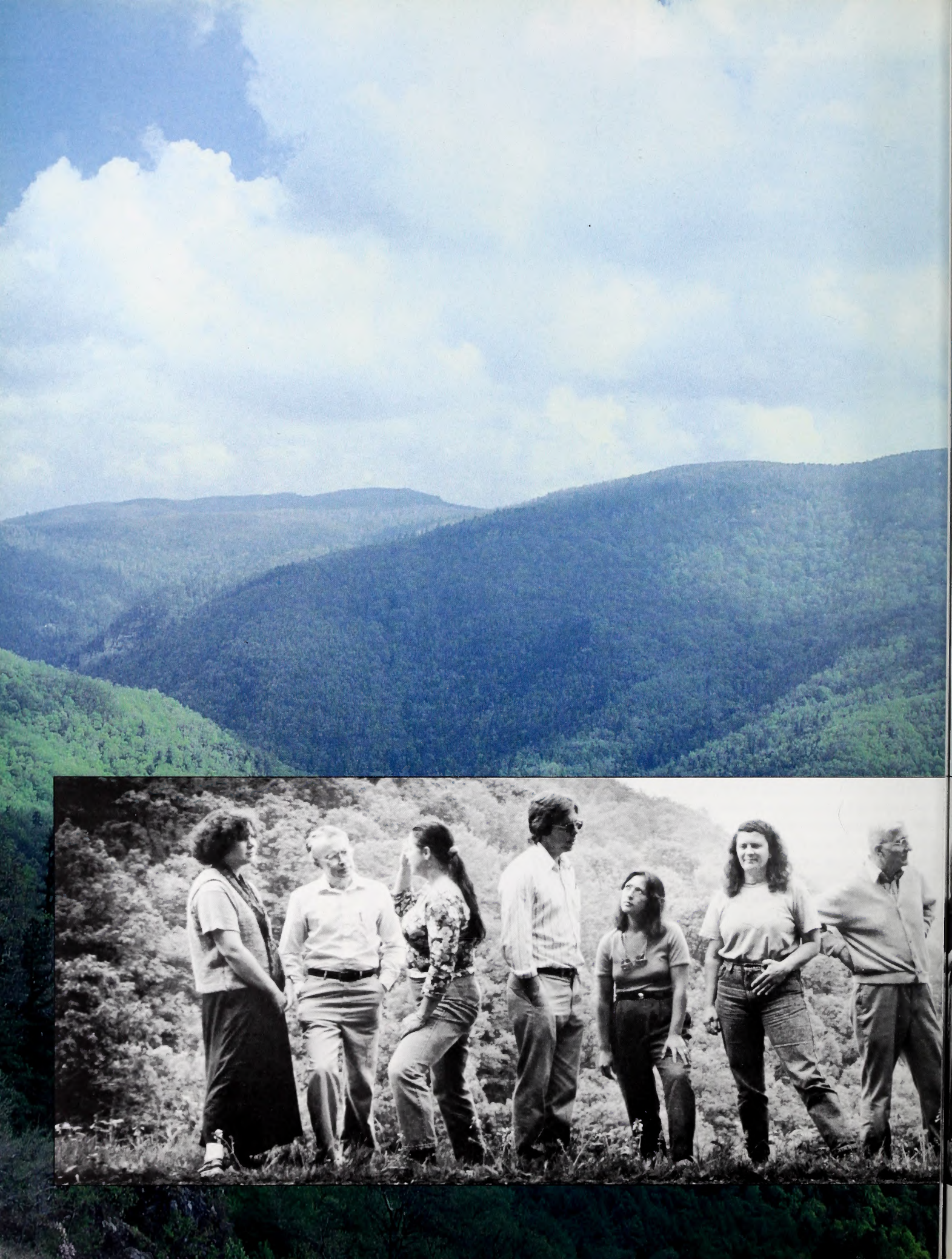
fish just quit. We have to pull anchor and go somewhere else."

Manooch confirmed his testimony. "When I used to dive," the researcher said, "we'd fish until they stopped biting, then go overboard to see what was going on. Many fish would often remain, but something—the barometer, the temperature, something—would cause them to lose interest in feeding. I don't know if we will ever get a handle on that phenomenon," he said, "but that's another thing the fish have going for them that limits harvest. Without it, some bottomfish might be in even more trouble."

By the time the *Carolina Princess* had anchored the first time, winds exceeded 20 knots and currents were running so hard that Captain Harker was unable to fish at the depth he wanted. Even so, the anglers caught fish at a good clip and the mates hurried to remove them from the hooks and string them on the customers' numbered strings. They hung these cords in a large box with ice (the high reached 78 degrees that winter day) and the cords soon grew heavy with sea bass, porgies and grunts. A scattered few displayed one or two small gag, and by afternoon the two or three top grouper specialists boasted strings of red and gag grouper weighing—some of them—4 to 10 pounds each, still only about half the average size of the early 1970s.

Captain Harker tried several locations, some more productive than others, but all inshore of the prime spots he wanted to fish. "With the current this strong, if we were in water 40 feet deeper than this, the fisherman couldn't even reach bottom," he said.

With winds building to over 30 knots, the seasoned skipper finally upped anchor and headed for Beaufort Inlet. A raincheck good for an excursion at a future date of the angler's choosing was given in compensation for the shortened trip. With fish to take home and a raincheck to boot, who could ask for a better deal? ⊠



The Mountains Go GREEN

What do loggers, bear hunters and tree-huggers have in common? The Western North Carolina Alliance, as it turns out, one of the best grass-roots environmental groups in the high country.

written by Lawrence S. Earley
photographed by Ken Taylor

She's offered coffee to her visitor and now Mary Kelly is hunting for a bag of ground coffee she thought sat beside the coffeemaker. Finally she turns and smiles sheepishly. "Well, I guess we don't have any coffee after all," she says. It's the only moment of the morning when this environmental "firebrand," as she's been called, seems to be at a loss for words. She's a woman in her mid-thirties, of medium height, her brown hair pulled boldly back from her forehead. When she talks, her words come easily, long strings of them — words like "environmental protection" and "natural heritage," but also "community empowerment" and "citizen participation."

Not surprisingly, these words represent the twin goals of the Western North Carolina Alliance, the group whose efforts she coordinates from its Asheville office. Acclaimed by many as the best organized and most effective environmental organization in the mountains today, the Alliance has achieved its success by combining a command of the issues with a shrewd understanding of a mountain people historically distrustful of elitist movements — especially environmental activism.

"We believe that environmental protection is most effective when you can get local people active," says Kelly. She's delighted when environmental activism teaches people how to hold meetings, work together as a group and make decisions. In the process, she says, they are learning to exercise more control over the forces that affect them and are learning, too, to break out of the isolation that has hampered mountain communities in the past.

In the nine years since it was founded in 1982, the Alliance has been in the thick of some of the region's most pressing environmental issues. In 1982, for example, it was instrumental in blocking leases for oil and gas explorations proposed for the Nantahala and Pisgah national forests. In 1984, it fought successfully for an ordinance banning developments on high ridges; in 1985, it criticized

***Members of the** Western North Carolina Alliance gather outside Asheville. Left to right: Laura Deaton (community organizer), Ron Lambe (administrator), Susie Burke, Paul Carlson, Elena Carlson, Mary Kelly (coordinator), Speed Rogers, Amy Mozingo, Monroe Gilmour, Bob Gelder, Bernard Elias, Burt Kornegay.*

Mary Kelly
Coordinator
Western North Carolina Alliance

and then appealed the U.S. Forest Service's 50-year plan for the Nantahala-Pisgah; and in 1986 it opposed the high-level nuclear repository proposed for two mountain counties. Today it focuses its energies in task forces on managing the national forests, on highway development and on water quality.

In the process, say many environmentalists across the state, it's become a bold and articulate voice for the mountain environment. Says Melva Okun of the University of North Carolina at Chapel Hill, "There's not any other group in the mountains like the Western North Carolina Alliance in terms of the area it covers and the number of people it touches." She compares it in methods and scope with the North Carolina Coastal Federation, another grass-roots program. Adds Michael Corcoran, executive vice-president of the N.C. Wildlife Federation: "They are a vigorous defender of mountain ecosystems."

> "Our continuing mission is to help people recognize that a healthy environment is part of the quality of mountain life, and that it can go real fast under the onslaught of development pressure from the outside."

Though the group has an Asheville office with several full-time staffers, the real work is done by members of six chapters in Macon, Jackson, Mitchell/Yancey, Highlands/Cashiers, Buncombe and Caldwell counties. The membership of 650 is encouraged to join task forces and get involved locally. A steering committee of 15, elected by the membership, sets priorities for the group, and the Asheville staff offers technical advice and information to chapters and other environmental groups.

Kelly has been the coordinator and spokesperson for the group since 1988. A Californian by birth, she moved to the mountains after getting her Ph.D. in ecology from the University of Georgia. Since taking over the coordinator's spot, Kelly has been outspoken on many issues, most recently the controversial firings last spring of a U. S. Forest Service botanist and a state official who protested the firing.

Her combativeness hasn't seemed to put off conservative mountain people — the membership has doubled in the past two years. Besides, the Alliance has always been known as a strange coalition of unlikely elements. Academics, biologists and botanists are drawn by the group's strong ecological leanings, yet loggers, foresters and hunters have also played important roles in the group's success. The second chapter of the Alliance was formed in Jackson County by a group of bear hunters.

This diversity of membership has been at times both the group's greatest organizational weakness and the source of its greatest strength. Indeed, some issues put a lot of pressure on the group's fault lines, threatening its solidarity from time to time. The Alliance's continuing support for land-use controls has alienated some of the members, as did its opposition to Duke Power Company's plans to construct power lines through Panthertown Valley. "We've had some rocky times," admits Kelly, "but we've learned to forgive each other."

They've learned also to leave some issues alone. The Alliance is mute, for example, on the issue of increasing roadless or wilderness areas in the mountains, even though wilderness is an important issue for many of the group's frequent allies — the Wilderness Society, the N.C. Wildlife Federation and the Sierra Club. "We avoid issues that will preclude our working with rural people," says Kelly. "We want to be able to reach those people in the rural counties who for better or worse have had a hard time with the idea of wilderness and what they think the Sierra Club stands for — urban hikers and that sort of thing."

At the same time, the group has realized that diversity is strength. "We spend a lot of time trying to develop stable and ongoing community chapters and task forces, and fostering a diversity of volunteers and members," she says. "When differences of opinion do occur, we have to keep returning to a common ground."

What common ground could tree huggers, loggers and bear hunters occupy? "Habitat," says Kelly. "Most of the group recognizes the importance of protecting habitat and that's the thread throughout our work that makes the Alliance a little different."

That may explain why the group's bread and butter issue has always been forest management. The Alliance's second chapter was formed by Jackson County bear hunters in 1985 after the U.S. Forest Service released a draft of its 50-year plan for the Nantahala and Pisgah national forests. The projected increases in clearcutting and road building stirred protests from state environmental

groups, but the bear hunters also opposed the plan because of its detrimental effects on bear habitat. Local loggers joined them because they believed they would lose jobs to bigger logging outfits.

"The people who worked in the Alliance early on recognized this strong grass-roots fear and loathing of what widespread clearcutting would do," says Kelly. "That's been our big issue, the feeling that these are public lands, that people's opinions should count, and that local users ought to have a right to say how the forest is managed."

The Alliance sponsored public meetings in several counties to discuss the plan. It formed its Forest Management Task Force to serve as a network of information for people bewildered by the plan's technical jargon. Members of this task force have taken advantage of the Forest Service's own planning process, meeting with Forest Service personnel for advance looks at areas proposed for timber sales and helping to modify project plans. The Alliance isn't opposed to clearcutting, but it opposes what it calls the Forest Service's excessive clearcutting to meet unreasonable timber quotas. A recent *Green Paper*, a periodic communique issued by the Alliance, summed up the group's goals for forest management on national forest lands: "continuous forest canopies, a diversity of plants and animals, protection of water and wildlife, abundant high quality recreation possibilities, and a continuous supply of high quality mature timber."

The Alliance prefers working cooperatively with the Forest Service, but when its recommendations are ignored, it will fight — sometimes successfully. Along with several other environmental groups, the Alliance appealed the final version of the Pisgah-Nantahala forest plan all the way to the chief of the Forest Service, winning a re-analysis of the plan that will consider new management alternatives. "Our appeal urged better protection of wildlife habitat and I think we were the only group to appeal on the basis that the Forest Service needed to do more for recreation planning," says Kelly. The Forest Service will release the new alternatives this summer.

The Alliance has also challenged individual Forest Service timber sales, at one site winning a remand of some units scheduled for clearcutting. For the impressive technical expertise of the group's appeals, Kelly credits the long-time work of Walton Smith, a former U.S. Forest Service forester and Alliance co-founder who chaired the Forest Management Task Force until last year. In 1990, Smith won the $20,000 Nancy Susan Reynolds Award given by the Z. Smith Reynolds Foundation for advocacy, the first citizen from western North Carolina to be so recognized.

The Alliance has also staked out a position supporting land-use planning, an explosive and divisive issue in a region where property rights are sacred. "We have a lot of members who recognize that the single most threatening impact we face and the underlying issue to a lot of other environmental issues is unplanned and rampant growth," says Kelly. "The reason land-use planning has failed so miserably in the mountains is that people have this traditional strong tie to the land and then here come these planning efforts out of Raleigh. Land-use planning is doomed to fail unless right from the start it involves local people in their local communities in a meaningful and substantive manner."

What riles mountain people more than anything, she says, is that by and large, they've been pretty good stewards of the land. "It's not the local people who want to build their houses on the highest peaks, necessitating a long driveway that runs with silt after every rainfall. And it's not local people who want a condominium on a creek, requiring a package treatment plant that leaks chlorine."

"We don't lobby in Raleigh for land-use controls," she says. "Our continuing mission is to help people recognize that a healthy environment and healthy streams and open space and wildlife habitat are part of the quality of mountain life and that it can go real fast under the onslaught of development pressure from the outside."

Other issues that have occupied Alliance energies recently have been highway development in the mountains, especially the I-26 project that threatens extensive tracts of wildlife habitat in Madison County. Their newest task force is focused on highways and transportation issues while a third concentrates on water-quality issues. The Alliance has also cooperated closely with many regional groups such as the Blue Ridge Environmental Defense League and the Clean Water Fund, sometimes giving and receiving technical assistance, sometimes acting as a fiscal sponsor, and sometimes lending its weight to an issue.

The Western North Carolina Alliance is looking forward to its 10th anniversary in 1992, a celebration, Kelly hopes, that will help launch its next decade of work. If it's as successful as the last decade, it will be because its formula of grass-roots environmental activism works in a region long suspicious of "outside agitators."

"What is so strong among the native people here is this connection to the land," says Kelly, "the traditional heartfelt feeling for being part of the fabric of the land and the streams and the forests." If Kelly is right, it's a powerful and untapped force that will lead to the betterment of the region. ⊠

Mountain Eco-Groups

As in every other part of the state, there are many groups in the mountains that champion a variety of environmental causes, rivers or places. Here's a selection of advocates for region-wide environmental protection.

Audubon Society — Elisha Mitchell Chapter
P.O. Box 5456
Asheville, NC 28813
(704) 628-2791

This chapter is focused on Forest Service issues and general conservation issues that include land-use management.

Blue Ridge Environmental Defense League
P.O. Box 88
Glendale Springs, NC 28629
(919) 982-2691

Dedicated to preserving the natural heritage of North Carolina, the Defense League is primarily involved in community organization and technical assistance, particularly in areas of health management and nuclear and hazardous waste.

Clean Water Fund
138 E. Chestnut St.
Asheville, NC 28801
(704) 251-0518

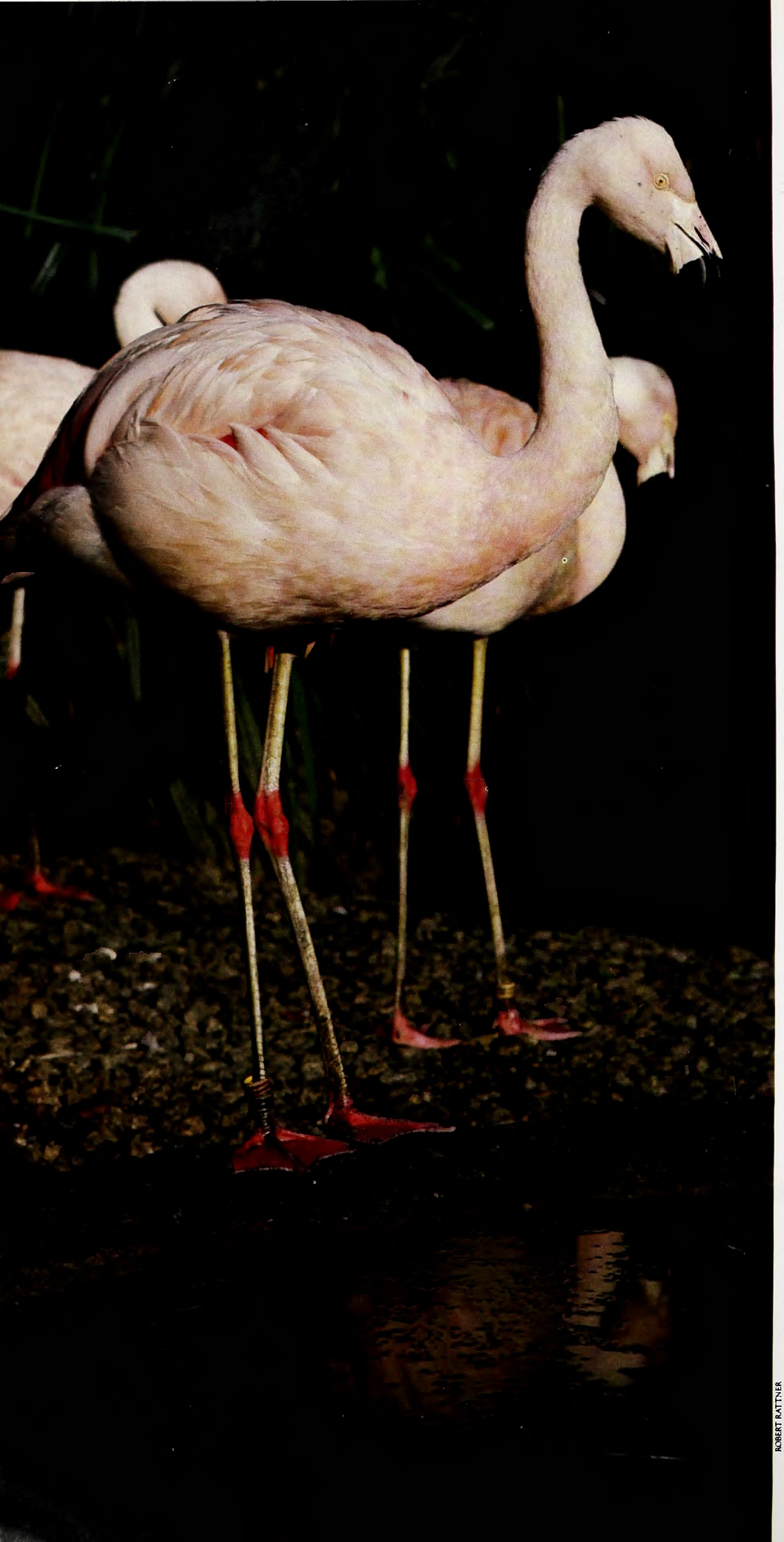
A grass-roots organization interested in a wide variety of environmental issues, but focused on water quality, both surface and ground water. Members also work with communities with environmental problems.

Trout Unlimited
Box 117
Asheville, NC 28802
(704) 253-7152

TU fights for clear streams and healthy fish populations in western North Carolina, and its various chapters lobby on behalf of broad water-quality issues.

Wilderness Society
1819 Peachtree Road, N.E., #714
Atlanta, Ga. 30309
(404) 355-1783

The regional office of this national group is active on behalf of forestry issues, particularly in the Nantahala and Pisgah national forests.



ROBERT RATTNER

Our

Flamingos once brought to mind tranquil tropical scenes framed by leaning palm trees. A modern version includes the neon night life of places purporting to be part of tropical life. In either case, most people can't conceal expressions of disbelief when they are told that we have flamingos here in the Carolinas.

Actually, in all fairness, flamingos are quite uncommon here, yet nearly every year a report or two of a flamingo in coastal North Carolina is phoned in to my office. Like others who take interest in our local bird life, I had always assumed that these records were of stray birds that had escaped from captivity or had wandered northward from the semi-domestic flock maintained at Hialeah race track in Miami. A few phone calls to curators in zoos confirmed my suspicion that flamingos were too costly (currently $1,100 each) to be allowed to roam freely. Captive birds are normally banded and pinioned so they are unable to fly. A survey of the known captive flamingos in the United States made in 1979 showed that only one of 762 birds had been reported missing since 1974. Thus, there was no indication that the unbanded free-flying birds reported from the Carolinas were simply escaped captives.

Actually, the first records of flamingos in the Carolinas go back to 1818, with additional reports from such well-known ornithologists as Audubon from 1840 to 1876. The first available North Carolina records are from Pea Island in June 1935. This scattering of early records, before the widespread practice of keeping flamingos in captivity, further suggests that our local birds are from free-flying wild stocks. It is now known that greater flamingos nested as far north as the Florida Keys until at least 1935, so while one might argue that these birds were the source of the early records, reports are available for nearly every decade since the 1920s, with numerous instances of birds remaining in an area for

***Though not native** to the state, flamingos have been reported in North and South Carolina almost every year. Remarkably, photos taken of flamingos here show that at least some are Chilean flamingos* (Phoenicopterus chilensis), *a species found in central and southern South America (left).*

Brilliant Visitors

The only flamingos most of us see around here are plastic, but once in awhile we get a visit from the real thing.

by David S. Lee

weeks or even months. An increase in the number of reports parallels the increase of interest in reporting the sightings of unusual birds.

My curiosity was aroused. I searched archival museum documents, news clippings and journals in order to assemble as many records as possible. A pattern emerged. The time of occurrence was not random as one would expect if the birds had escaped and were simply wandering here and there. The compiled reports fell into two distinct periods—November through February and mid-June through the end of July.

Although there are no specimens from the Carolinas, there were a small number of photographs taken of birds along the coast of both states. By examining these photos, I hoped to be able to see if the birds were banded, or at least learn something about their age (young are always paler than adults).

To my astonishment what I learned was most unexpected. These flamingos photos were not of the greater flamingo—the species found in northern South America, the Antilles and the Bahamas—but of the Chilean flamingo of central and southern South America. Surely these must represent escaped captives. A recheck of the listing of captive flamingos revealed that the greater flamingos (called American flamingos in some books) outnumbered the Chilean flamingo nearly two to one. Something was amiss.

At first it seemed absurd to consider that Chilean flamingos in the Carolinas may be from wild South American stock but this cannot be ruled out. While the greater flamingo is relatively sedentary, the Chilean flamingo is highly migratory, moving south in the austral spring to its major breeding areas. Ornithologists have demonstrated for some migratory songbirds the role of "mirror-image" navigational error, where birds from opposite hemispheres, migrating with the aid of the earth's magnetic fields, end up in the right place but on the wrong continent. It is well documented that this does occasionally happen to songbirds, and such a scenario is quite feasible for a strong-flying flamingo. Furthermore, this may explain why so many of the records I assembled were of winter birds. Winter is hardly the season one would expect a tropical species to come north, yet this is the summer breeding period of a South American bird and the precise season confused birds would be directed northward.

While it is interesting to speculate that navigational error is responsible for the presence of Chilean flamingos in North Carolina, this is nothing more than mental exercise. At present there is little point in defending any potential source of origin of free-flying local flamingos. While a reservoir of captive birds provides a logical explanation of their occurrence, there is no indication that this is really their source. Based on photographs, we now know the Chilean flamingo occurs here, but the similar-appearing greater flamingo may be here too. The records from the 1800s through the 1930s, before the potential source of captives, give no hint as to the identity of the species in question. They were simply assumed to be greater (American) flamingos, based on geographic probability. The confirmed presence of Chilean flamingos now makes it advisable to question all earlier flamingo records that were recorded in state bird books and other such places as "American flamingos." Biologists recognize that the Old World flamingo, *Phoenicopterus roseus*, and the American flamingo, *P. ruber*, are closely related and assigned them both to the same species. This combination is now officially referred to as the greater flamingo. The Chilean form, *P. chilensis*, is also of close affinity but is still considered a distinct species. While for most bird students the main question is what name goes on the bird, the real issue is where are they coming from.

This is the type of natural history question that is frustrating to me, for there is currently no practical way to resolve it. The possibility exists of a mixture of wild flamingos of both species plus escaped captives, or at least it can never be disproven. I have noticed a renewed interest in setting out pairs of pink flamingo decoys in front yards, so I suspect a growing number of people have become intrigued with the phenomenon of navigational error by birds. Perhaps someday we *will* learn the answer. ⊠

David S. Lee is curator of birds at the N.C. Museum of Natural Sciences in Raleigh.

***Some of the flamingos** reported in North Carolina may be greater flamingos* (Phoenicopterus ruber), *the species found in northern South America, the Antilles and the Bahamas. The first confirmed flamingo sighting in the Carolinas dates back to 1818. Although biologists can speculate, no one really knows why flamingos turn up here.*

DAVID S. LEE

Over 50 Schools Compete in Annual Shooting Event

Pender, Yadkin Schools Win Hunter Safety Tournament

Written and Edited by Vic Venters

Students from Pender County's Burgaw Middle School and Yadkin County's Forbush High School shot their way to top honors this spring in the state's annual shooting competition in Granville County.

Nearly 500 students from 54 schools across North Carolina participated in the N.C. Wildlife Resources Commission's 13th annual Hunter Education Tournament. The event was hosted by the Wake County Wildlife Club and the Sir Walter Gun Club.

The Burgaw Middle School team scored 2,783 points out of a possible 3,200 in the junior division, while the Forbush High School team scored 3,035 in the senior division. Kyle James of Forbush Elementary School scored the highest individually in the junior division with 725 points out of a total of 800 points.

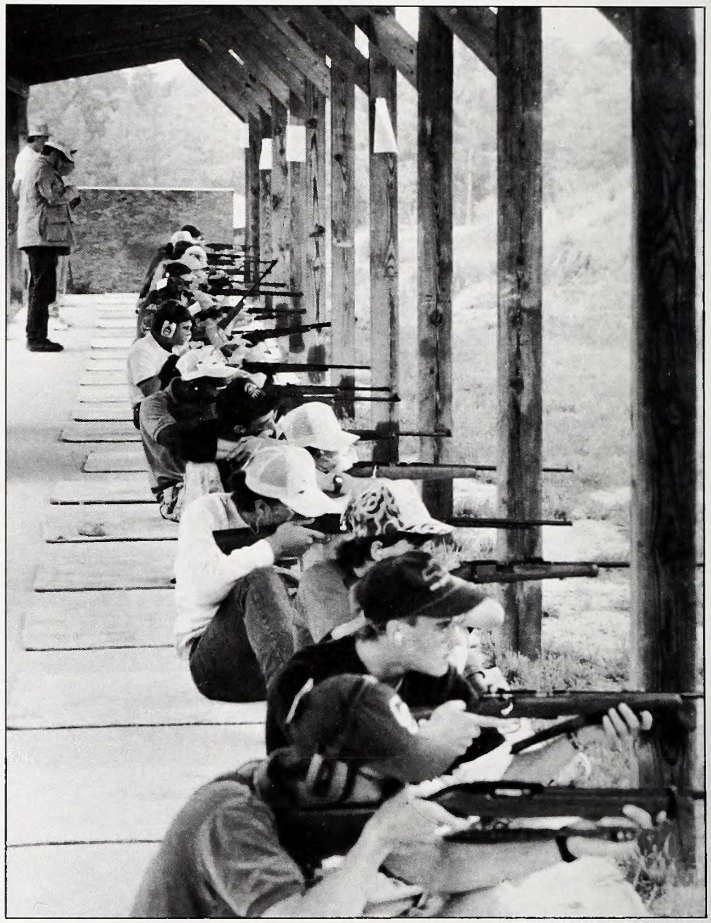
David McMurray of East Henderson High School in Henderson County scored the highest individually in the senior division with his score of 733 points.

The students competed in four categories — shotgun, rifle, archery and hunter skills. "For many of these kids, it's the highlight of their year," said Capt. Wilton Pate, who heads the hunter-safety program for the Wildlife Commission. "It gives them an opportunity to put into effect what they've learned in the hunter-education course they've had in school. By demonstrating their skills, they can go beyond the minimum performance required in the classroom. As a result, we're turning out better sportsmen for the future."

The winning teams are scheduled to represent North Carolina this month at the National Rifle Association's Youth Hunter Education Challenge in Raton, New Mexico.

Since 1982, the Commission has trained about 25,000 students per year in North Carolina's hunter-education program. In July, the Commission's hunter-education course will become mandatory for first-time license buyers. Hunters who produce an old license will not be required to take the course.

— Angela Dorman Hill



NC WILDLIFE RESOURCES COMMISSION

Having A Blast: *Students from junior and senior high schools across the state compete in the rifle category at the N.C. Wildlife Resources Commission's annual Hunter Education Tournament in Granville County.*

Unique Program Promotes Conservation

Coreopsis Named Wildflower of the Year

For the price of a stamp, you can obtain an information pamphlet and a packet of Coreopsis seeds, a fine native perennial wildflower found in North Carolina. The Coreopsis (*Coreopsis auriculata)* is the 1991 North Carolina Wildflower of the Year (WFOY).

The WFOY program is a cooperative conservation project sponsored by the North Carolina Botanical Gardens and the Garden Club of North Carolina. It is designed to teach the "conservation through propagation" philosophy and offer wildflower lovers a propagated alternative to plants collected from the wild.

Coreopsis is hardy and low-growing and occurs in rich woodlands and thickets throughout the southeastern United States. In the garden, the plants perform equally well in either sun or light shade. They require little maintenance save for an occasional watering during summer dry periods.

Coreopsis spreads to form colonies by way of stolons, which end in leafy rosettes. The flower heads are about 2 inches in diameter with yellow ray flowers.

To receive a free package of Coreopsis along with a descriptive brochure and planting instructions, send a stamped self-addressed business envelope to WFOY 1991, N.C. Botanical Garden, Campus Box 3375, Totten Center, UNC, Chapel Hill, NC 27599-3375. You *must* send a SASE to obtain seeds.

— Rob Gardner
N.C. Botanical Garden

Superfund Helps Restoration

Turkey Releases Set New Record

North Carolina's wild turkey program took great strides toward its ultimate goal of restoring the bird to all suitable range in the state this year. A record 508 wild turkeys were relocated. Of this number, 228 birds were trapped in-state, while 204 birds were trapped in South Carolina and 76 birds were trapped in Wisconsin. The 280 birds from South Carolina and Wisconsin were acquired through the National Wild Turkey Federation's Super Fund program.

Under this program, states furnishing birds are reimbursed for their trapping costs at the rate of $500 per bird. These funds must be used for the benefit of the wild turkey in that state — for habitat acquisition, research or management. The Wildlife Resources Commission funded $80,000 for the acquisition of wild turkeys through the Super Fund program this year. The other $60,000 was funded by the North Carolina State chapter of the National Wild Turkey Federation.

Since 1970, over 2,000 wild turkeys have been relocated in North Carolina and the statewide population has increased from less than 5,000 to over 28,000 birds. The tremendous progress with the wild turkey restoration project this year should pay big dividends down the road. With proper protection, most restoration sites develop huntable populations of turkeys within five to six years and the spring gobbler season can be reopened.

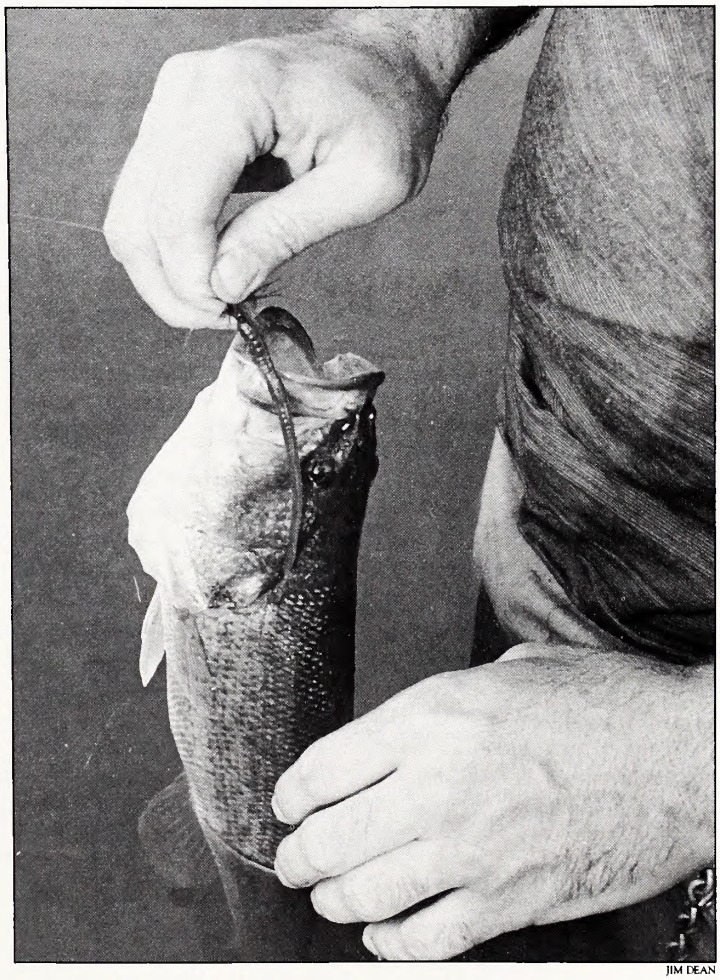
— Mike Seamster

KEN TAYLOR

Back to Nature: *With releases of live-trapped wild turkeys to new locations, the N.C. Wildlife Resources Commission is restoring wild turkey populations to many areas of the state. Since 1970, the state's population of wild turkeys has jumped from less than 5,000 birds to over 28,000.*

Largemouth, Smallmouth, Spotted Bass

Commission Sets New Black Bass Limits



JIM DEAN

New Limits: *The creel limits for all black bass species — largemouth, smallmouth and spotted bass — in North Carolina has been reduced from eight to five fish. The new limits are designed to protect these popular gamefish from overharvest.*

Whether you're fishing for largemouth, smallmouth or spotted bass, remember that there are now new creel limits in effect for these black bass species.

The general daily creel limit for the three black bass species has been lowered from eight bass per day to five per day. The exception to this new limit is Calderwood Reservoir, where a reciprocal agreement with Tennessee allows a 10-fish creel limit.

The new limits are designed to regulate increasing angling pressure on bass and prevent overharvest. The popularity of bass fishing has continued to grow and in many hard-fished public waters, even good anglers have had a hard time catching the old limit of bass.

Size and slot limits vary in some counties, lakes and reservoirs, so be sure to check local regulations posted at the lake and the *1991-92 North Carolina Inland Fishing, Hunting & Trapping Regulations Digest* for the limits applicable to the body of water you are fishing.

Henson Praises Volunteers

Wildlife Commission's Nongame Turtle Program Wins Award

The Wildlife Commission's work in helping save endangered and threatened sea turtles was recognized this spring when Tom Henson, coastal biologist with the Commission's Nongame and Endangered Wildlife Program, accepted a North Carolina Take Pride in America award from Governor James G. Martin. Henson leads a network of about 80 volunteers who monitor sea turtle nests, hatchlings and strandings along our coasts. He also coordinates turtle-related activities and work between the Wildlife Resources Commission, the N.C. Division of Parks, the National Park Service and the U.S. Marine Corps. "I'm grateful to accept the award," said Henson. "It's an important program. I must say that it's the network of volunteers who deserve much of the credit. They put in a lot of hard hours and they don't get paid. Without them, I don't think it would be possible."

Last year had its ups and downs for sea turtles along the North Carolina coast. The good news is there were 759 confirmed nesting sites in 1990, a record number. The bad news is that sea turtle strandings almost doubled, jumping from an average of 150 confirmed deaths annually to 292 in 1990. One reason for the large increase in deaths were two large kills, one in the spring and one in the fall. In the fall kill, abnormally warm water off the coast kept sea turtles offshore longer than usual and led to 58 confirmed deaths, most of which resulted from drowning in commercial trawling nets near Hatteras and Ocracoke Islands.

NC WILDLIFE RESOURCES COMMISSION

Turtle Tribute: *Tom Henson, coastal biologist for the Wildlife Resources Commission's Nongame and Endangered Wildlife Program, accepts a North Carolina Take Pride in America award presented by Gov. James G. Martin (left) and William W. Cobey Jr., (right) Secretary for the N.C. Department of Environment, Health and Natural Resources.*

$150,000 Needed for Tract

Triangle Land Conservancy Seeks Unique Land

In the 1980s, few counties in North Carolina had as much growth and development as the Triangle region — Wake, Durham, Orange, Chatham, Lee and Johnston counties. The Triangle Land Conservancy is a local land conservation group that's attempting to preserve significant natural areas in the Triangle before they are paved over or plowed under. So far, the Triangle Land Conservancy — modeled after land conservation groups like The Nature Conservancy — has had some notable successes, including preserving a tract near the Deep and Rocky rivers in Chatham County containing a disjunct population of white pines, a mountain species rare in the Piedmont.

The Conservancy has a similar goal for Swift Creek Bluffs, a series of steep, north-facing bluffs rising almost 100 feet above the south side of Swift Creek in Wake County near Cary. On the bluffs are numerous large mature beech trees, a variety of wildflower species and other plants normally more common in the mountains than in the eastern Piedmont.

The 23-acre site is within five miles of downtown Cary and, if not acquired, will probably be developed eventually. The cost to purchase the tract from private hands will be $150,000 and must be raised by Dec 31, 1991. The town of Cary has agreed to commit a matching grant of $50,000 when the Triangle Land Conservancy raises $100,000. An additional $15,000 must be raised to provide a small parking lot, signs, trails and a perpetual stewardship fund.

If purchased, the Swift Creek Bluffs natural area will be open to the public for walking and nature observation. For more information or to contribute, write the Triangle Land Conservancy, P.O. Box 13031, Research Triangle Park, NC 27709-3031.

STEVEN A. WILSON

Natural Treasure: *The Swift Creek Bluffs area in Wake County may be developed unless the Triangle Land Conservancy can raise enough funds to purchase it. This Piedmont site contains large beech trees and other species normally found in the mountain region.*

Teal, Bald Head Lighthouse Featured

New Duck Stamp Now Available

Four blue-winged teal and the Bald Head Lighthouse are featured on North Carolina's 1991 duck stamp and art print. (See inside of back page this issue for color reproduction of print and stamp.) This is the third of seven years the N.C. Wildlife Resources Commission is featuring one of the state's lighthouses in paintings for the annual waterfowl stamp print program.

Wildlife artist Phillip Crowe of Franklin, Tennessee, painted this year's print after a trip to Smith Island (also known as Bald Head Island) at the mouth of the Cape Fear River.

Art dealers are now taking orders for the 1991 print. The print will be on sale through Dec. 31, 1992. After that, remaining duck stamp prints will be destroyed to increase the value of the prints bought by collectors. In 1989, the Commission adopted a policy to destroy all unsold waterfowl and sportsman's stamp prints six months after the accompanying license stamps expire.

Beginning July 1, the waterfowl stamp will be available from Wildlife Commission hunting and fishing license agents. North Carolina's duck stamp program is eight years old. Since 1987, waterfowl hunters in North Carolina have been required to buy a state waterfowl license in addition to the federal waterfowl stamp. Prior to 1987, the purchase of stamps was voluntary. Money generated from the sale of waterfowl licenses and print royalties goes into the Commission's special Waterfowl Fund. The fund has helped purchase thousands of acres of wetlands in the state and is helping the state meet its financial obligations in the implementation of the North American Waterfowl Management Plan. This revenue also has funded a goose-restoration project.

— Angela Dorman Hill

Executive Director to Receive Reports

Professional Development Council Formed

Professional Development Council: *Members of the Wildlife Enforcement Division's Professional Development Council pose after their introduction to the 13-member Wildlife Resources Commission. The council was set up to provide an unrestricted flow of information to the Commission's executive director, to improve working conditions and to assist officers with professional problems. Officers from each of the nine wildlife districts elected a representative to the council. The current and immediate past Wildlife Officers of the Year serve on the council. From left: V. Lamar Worley, District 9; Joseph R. Fowler, District 7; Lt. C. Dennis Thompson, District 3; Sgt. Dwight G. Davis, District 4; John E. Massey, District 5; Sgt. Chester S. Ragland, District 8; Tony Williams, District 2; W. Tony Pennell, District 1; Lt. Danny Pierce, District 6; Sgt. Kenneth Everhart, 1991 Officer of the Year; and Sgt. David M. Stokes, 1990 Wildlife Officer of the Year.*

Deer Hunting Show in Charlotte

Carolina Buckarama Slated This Month

If you've already got buck fever by July, the North Carolina Wildlife Federation has the deer hunting and outdoor show for you. On July 26-28 in Charlotte, the Federation will present the Carolina Buckarama at the Metrolina Expo Center.

The show, presented in cooperation with the Georgia Wildlife Federation, will feature equipment exhibits, a trophy deer head scoring contest, guides and free seminars by the experts. Among the experts featured will be Noel Feather, a noted bow hunter and Galen Shinkle, the famous trick shot archer. Also featured will be Scott Osborne, the Wildlife Resources Commission's deer expert who will talk about deer management in North Carolina. There will be numerous equipment exhibits as well.

For more information, contact the North Carolina Wildlife Federation, P.O. Box 10626, Raleigh, NC 27605 or call Dixon Herman at (704) 328-6634.

"George, what have they done to you?"

Kit Provides Facts

Information Packet Promotes Sportsmen

Tired of putting up with anti-hunting nonsense from co-workers, relatives or acquaintances?

If so, get the facts on how hunter-supported wildlife management has contributed over $12 billion to conservation programs and has led the fight to restore many of North America's wildlife species. To help sportsmen explain their role in modern wildlife conservation, the National Hunting & Fishing Day headquarters is making available "One-on-One" kits that include *What They Say About Hunting* and *Hunter and Conservation*. With this kit, you'll have the information you need to counter emotional fiction with hard facts. To order a kit, send $5 to National Hunting & Fishing Day, 555 Danbury Road, Wilton, CT 06867-2217.

STOP Wildlife Violations!
Report Violators
1-800-662-7137

On Golden Ponds, Turkey Business

by Vic Venters

There's no better place to be in the middle of the summer than on the water. Your pond, for instance. Bring along more than a fishing pole, though.

Pond Construction: The summer is a good time to build that fish pond you've been dreaming of. For fisheries purposes, you'll want to have the pond completed and filled by September or early October. Remember, you'll need to contact a representative from the U.S. Army Corps of Engineers to make sure the site is not a wetlands. The U.S. Soil Conservation Service (SCS) can help you design the pond so that problems with weeds, siltation, water fluctuations are minimized or do not occur. Check with your local SCS representative for more information.

Check Your Fish: During very hot weather, check your pond at sunrise for signs of stressed fish. Look for fish at the pond's surface gulping for air. If this is happening, your pond's fish are probably suffering from oxygen depletion caused by the hot weather. You'll need to discontinue any supplemental feeding and fertilization. Food that is not eaten will decay, often speeding oxygen depletion in hot weather. Also, aerate the pond as soon as possible. Commercial aerators are best, but oxygen can be added by circulating water with an irrigation pump. If you don't have a pump, try running an outboard motor around in the pond.

Drain and Millet: You should begin drawing down water levels in waterfowl impoundments or beaver ponds in preparation for planting Japanese millet to attract waterfowl in the fall. If you have a beaver pond, you'll need to place a drain in the dam so that water levels can be manipulated. Japanese millet provides your best bet for establishing a grain crop in the moist pond soil. In western North Carolina, millet should be broadcast on exposed pond bottoms by July 15. In the Piedmont and Coastal Plain, you can wait until later in the month or in mid-August before broadcasting millet. The crop should mature in 60 to 90 days, providing a popular food source for waterfowl in the fall.

Food Source: The National Wild Turkey Foundation is a not-for-profit organization that works cooperatively with state and federal agencies and corporate and private landowners to enhance wild turkey management and restoration throughout its range. The Foundation has developed Project Help (Habitat Enhancement Land Program) to assist landowners with information about purchasing appropriate seed and seedlings for managing openings as wild turkey feeding areas. For information about sources for these wild turkey food plot materials call 1-800-THE-NWTF. For information about Project HELP and a publication about seeding rates, fertilizer, lime rates and planting dates, call 803-637-3106, or write NWTF, P.O. Box 530, Edgefield, SC 29824.

The 1991 North Carolina Duck Stamp Print is here!

"Bald Head Blue-wings"
painting by Phillip Crowe

Phillip Crowe painted these blue-winged teal in flight near the Bald Head lighthouse for the 1991 North Carolina duck stamp and print.

To order your 1991 North Carolina duck stamp or print, contact your local license agent or picture framer/art dealer. Money from the sale of these prints supports waterfowl management such as land acquisition, protection of wetland habitat and research.

Dawn's Early Bite

A fly fisherman tries his luck as the rising sun gilds the early morning mist. Bass and bluegills have breakfast on their minds, and so, perhaps, does the angler.

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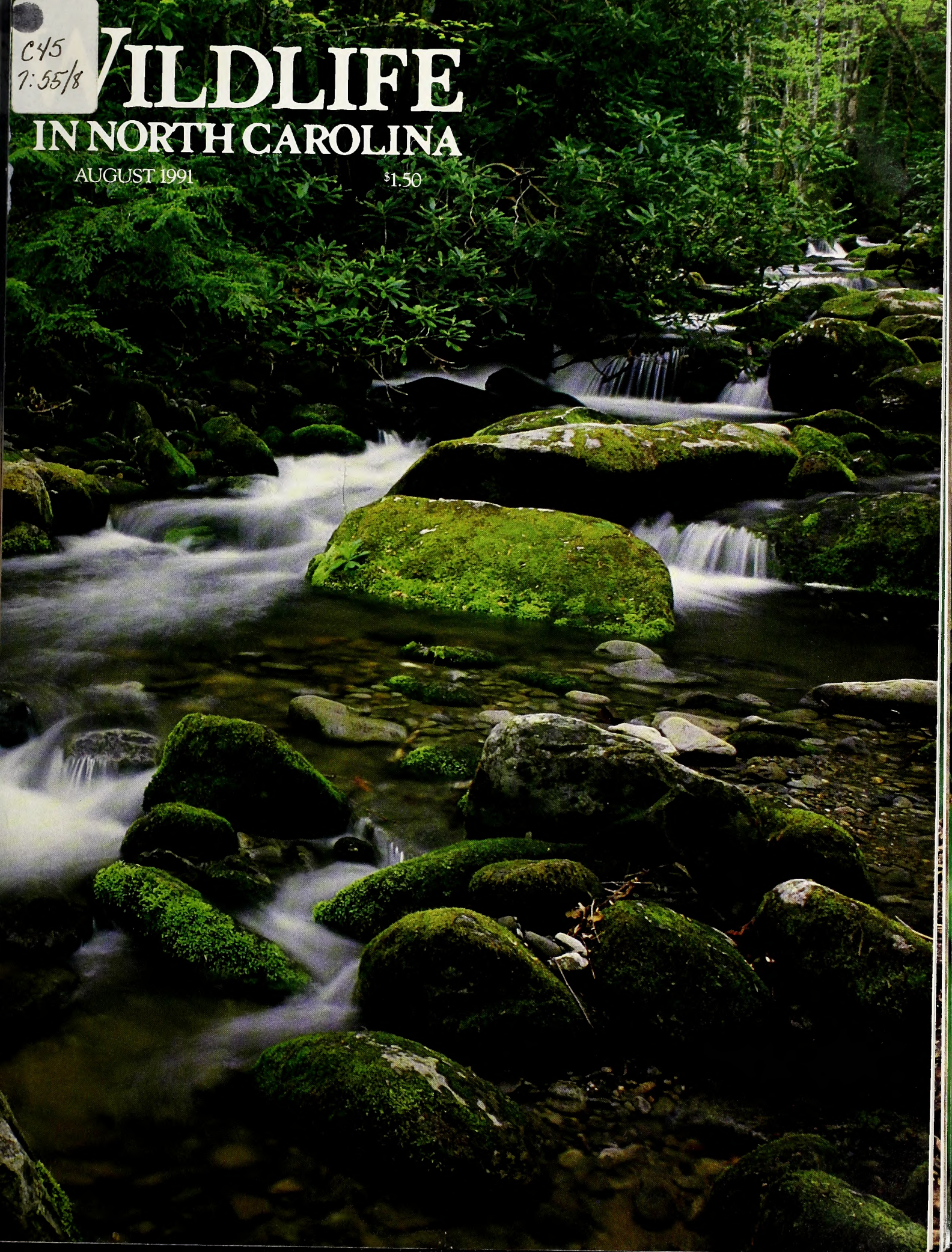

Out On Maneuvers

by Jim Dean

Every military tactician has a pet theory to explain the efficient resolution of the recent Desert Storm operation—superior air power, Patriot missiles, better-trained troops. But could it be that this late unpleasantness reached a hasty conclusion partly because there are no fish to catch in the desert?

It's a little-known fact—and may even be top secret—that military personnel rank second only to fire-fighters as avid fishermen. Despite a notoriously rigorous schedule, military folks get time off just like the rest of us. And they get to take it in some pretty unique places.

When I was serving Uncle Sam, I quickly learned that one of the first things you do when you get a new assignment is consult maps and MAAG (Military Anglers Advisory Group) to learn the off-duty potential at your new station.

When I reported to Ft. Holabird in Baltimore in the mid-1960s, my new boss—a full-bird Colonel—called me to his office where I sat nervously while he reviewed my personnel file. After several tense minutes, he reached the section that listed my hobbies. Tossing the file aside, he grinned and asked me when I thought I could get a free weekend to go with him largemouth bass fishing on Maryland's Eastern Shore.

ILLUSTRATED BY JACKIE PITTMAN

That was not my first inkling that life in the army might not be all spit and polish. A year earlier, during summer training, I drew KP a couple of days while our company was on field maneuvers in Virginia's Shenandoah Valley. After the potatoes were peeled, we had some free time. Most of my exhausted fellow pot washers took naps, but I fished a stream that happened to run past the obstacle course. Less than a hundred yards away, muddy recruits were crawling under barbed wire and live machine-gun fire while I caught smallmouth bass. I decided I was pushing my luck when an unarmed rocket landed in the middle of the creek.

The Colonel loved that story. It reminded him of a trout stream in Germany he'd fished in 1945 while Allied troops were still tidying up pockets of resistance. His problem wasn't matching the hatch; it was dodging sniper fire.

At Holabird, I met John Iwanowski who worked at the post as a civilian, and he encouraged me to join the Baltimore Anglers Club. It was a small group, but its 20-some members must surely rank among the most obsessed anglers in history. They included Lefty Kreh, a night watchman at Ft. Detrick who has since become the reigning international guru of fly fishing, and Boyd Pfeiffer, an anatomy student who later became outdoor editor of the *Washington Post* and authored countless articles and several fishing books. Likewise, Charley McTee and Joe Reynolds have both become successful outdoor writers, and Jack Goellner is now director of the Johns Hopkins University Press. Our mentor was the late Joe Brooks, an honorary member and Baltimore native who was then angling editor of *Outdoor Life*.

Falling in with such a bunch was a dream come true. In early spring, we'd fish the shad runs in the Susquehanna River and Rappahannock. Above Conowingo Dam, we caught largemouth and smallmouth bass. The Upper Potomac some days yielded 50 or more smallmouth a day on flies, and even then Lefty could cast an entire 90-foot flyline without the rod! On Chesapeake Bay, we crabbed and fished for stripers and yellow perch. Mayfly time took us to Big Hunting Creek in western Maryland for trout, or to the Letort and Yellow Breeches limestone streams at Carlisle, Pennsylvania.

Of course, I realize that I was fortunate to have served during a time of peace—Vietnam was just heating up. It could have been far different under other circumstances. I was also lucky to have served in an administrative outfit whose unofficial motto was "Retreat Hell, Backspace!" But during those two years, I came to appreciate the appeal of a military career that blended hard work, pride in public service, good friends and superb fishing.

Even after completing active duty, the armed forces offered occasional opportunities to wet a line in out-of-the-way places. At summer camp one year, my unit flew to Camp McCoy, Wisconsin, where we spent two torrid weeks in classes. After 5 o'clock, however, we were free to pursue our pleasure. Most found little to do, but I quickly located a sandy-bottomed stream that ran through the camp. It was full of wild brown trout. At the end of training, 269 reservists had the opportunity to vote on whether to return to Camp McCoy for the following year's training or go back to Ft. Knox. The vote was 268 to 1 in favor of Knox. I think the Colonel would have made it 267 to 2.

Is it any wonder I suspect the lack of a good trout stream in the Persian Gulf might have been added incentive to get the job done quickly?

August, 1991
Volume 55, Number 8

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Health, and Natural Resources

William W. Cobey, Jr. / Secretary

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WILDLIFE IN NORTH CAROLINA

Wildlife in North Carolina is the official educational publication of the North Carolina Wildlife Resources Commission, and is dedicated to the sound conservation of the State's wildlife and other interrelated natural resources and the environment we share with them.

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Cover *Deep in the Smokies, this pretty stream hosts plenty of wary brook trout. Photograph by Tim Black.*

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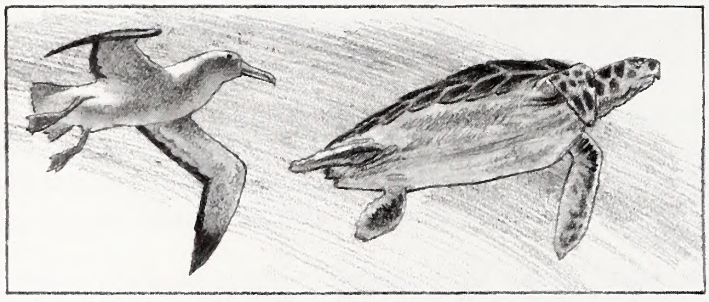
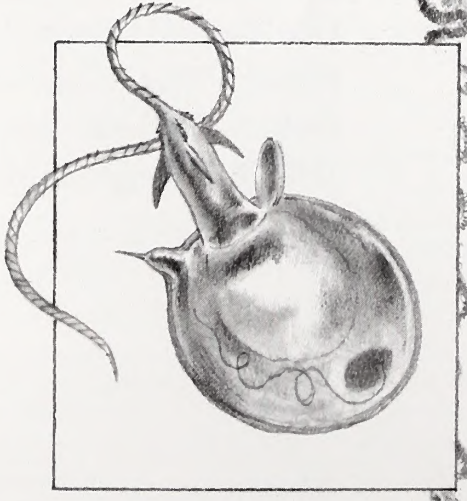
Flotillas of Portuguese men-of-war *sometimes make an appearance on North Carolina beaches in summer and fall. The float functions somewhat like a sail and distinguishes the man-of-war from the true jellyfishes, which lack floats.*



The man-of-war preys on *fish about as large as itself, but it has its own enemies. The albatross, the purple sea snail and two sea turtles—the loggerhead and hawksbill—will eat the floats of men-of-war.*



Covering the man-of-war's *tentacles are thousands of stinging cells. Each contains a pointed stinger, coiled and hollow, that's part hypodermic needle, part harpoon. When triggered, this stinger is propelled outward much like a harpoon. When it strikes a fish it carries nerve poison into the wounds like a hypodermic needle.*

Tentacles of a man-of-war *can extend up to 30 feet, although longer tentacles have been reported. Off North Carolina, the stinging tentacles average somewhat less than 20 feet in length.*

All for One, One for All

written by Lawrence S. Earley/illustrated by David Williams

They've been described as looking like a mass of iridescent bubbles bobbing on the sea, but when storms blow them into our coastal waters in summer and early autumn, most swimmers don't wait for a closer look. "Man-of-war!" someone shouts, and the cry is quickly taken up by others. Mothers grab children, fathers count heads and all eye the sinister forms floating closer and closer to shore.

It may sound like something out of a summer scare movie, but the Portuguese man-of-war is definitely a sobering sight. The sting of this jellyfish relative can send you to a hospital—more rarely, to a grave.

Yet the man-of-war has a stranger story than its venemous sting. Scientists classify the man-of-war as a member of the siphonophores, tropical and semi-tropical organisms that are related to the jellyfish but are not true jellyfish. The strange thing about members of this order is that they are not considered single organisms, but colonies of separate organisms, each performing a vital role for the survival of the whole.

Some biologists even refer to the man-of-war as a number of different "persons"—floating persons, feeding persons, stinging persons and reproductive persons. On top is the floating person, the purplish float shaped like a broad comb. Filled with nitrogen and lesser amounts of oxygen and argon, the float catches the prevailing winds very much like a sail.

In fact, scientists have discovered that the man-of-war is driven by the winds but that it can follow a zig-zag course, tacking 45 degrees to one side of the prevailing wind direction, and then 45 degrees to the other side. It's mostly a matter of physics, not intelligence, says Dr. Frank Schwartz of the University of North Carolina Institute of Marine Sciences in Morehead City. "The side of the float that's out of the water shrinks, and that causes the man-of-war to flop over to the other side. Eventually the other side dries out and the man-of-war flops again. The result is a zig-zag course, not just passive floating around."

The deadliest part of the man-of-war are the tentacles that can extend up to 30 feet below the surface. Among them are the tentacles and cells, the business end of the Portuguese man-of-war. The stinging tentacles are like long fishing lines, each armed with thousands of stinging cells called nematocysts. The cell contains a coiled thread, pointed and hollow like a hypodermic needle and carrying a poison. A fish that blunders against a tentacle is instantaneously harpooned by thousands of these threads, each one injecting its load of venom. The stunned fish is retracted to the mouth where it is dissolved and digested. The nutrients are then distributed to other parts of the colony.

As fatal as contact with these tentacles usually is for a fish, a curious symbiotic relationship exists between the man-of-war and a small fish, the *Nomeus gronovii*. Swimming unharmed amid the dangling tentacles, the fish is protected from predators while apparently developing a limited sort of immunity to the man-of-war's sting.

The Portuguese man-of-war got its colorful name during the age of sail when adventurers, glimpsing it for the first time, compared its float to the Portuguese fighting ship of the day. Little did they know how apt the name was. What they were seeing was something very much like their own ships, a colony of individuals whose coordinated labors were essential for the survival of the whole.

EDDIE NICKENS

Float tubes can be used *productively for either hunting or fishing. Lee Davis (left) waits in his belly boat for the morning flight of ducks. Most sportsmen today use commercial models available in a variety of shapes, sizes and colors with options ranging from back rests to motor mounts.*

Getting in There With 'Em

Call them belly boats or float tubes, they'll put you in the middle of the action for bass, ducks or whatever. Here's what you need to know to join the fun.

by Eddie Nickens © 1991

My friend Lee was jealous, pea green jealous, I-gotta-have-what-you-got jealous. It was the kind of jealous Moses warned about when he came home from the stone tablet bookstore. A brief glance at my new toy and he broke one of the Big Ten. Lee Davis coveted his neighbor's possession.

"I told you," I said as I bobbed in the waters of a Jordan Lake cove. "I told you months ago you'd want one, and now it's too late."

Indeed, the October duck season would open the next day, and it was too late for Lee to buy a belly boat of his own in time to join me. For months I'd boasted of my belly boat's fishing powers. I'd used it to fish tiny game lands ponds, float Piedmont streams with flyrod and spinner, and cruise the shorelines of large reservoir coves. Now I was determined the next morning to go where no duck hunter had gone before: smack in the middle of a Jordan Lake cove thick with wood ducks in the early morning. My belly boat would take me there. Lee would be left on shore.

But little did I suspect the power of his envy, and the ingenuity it would fuel. "You just wait," he told me, as I merrily paddled about. "I don't need a fancy-pants high-dollar floater bubble. Pick me up at four in the morning and you'll see."

A few hours later, in the glare of headlights, Lee proudly displayed a tractor-trailer tire inner tube to which he'd lashed a bright blue boat cushion. Just add water, he said, and it's a float tube.

Well, sort of. I do believe Lee rolled a

duck or two that morning, and for two years he bobbled about in his makeshift bubble boat. But soon enough he broke down and bought his own fancy-pants, high-dollar model, with a higher backrest than mine and a world of pockets. It was my turn to be pea green jealous.

Float tubes, belly boats, floater bubbles—by any name, they open new worlds of outdoor opportunity and spell the end of the road for big bass and boss mallards. First made popular by Western anglers who used them to stalk wary trout in high mountain lakes, it didn't take long for Eastern anglers to realize these personal flotation devices were just the ticket for small farm ponds and secluded coves. Gung-ho duck hunters, always looking for the next gadget, were no hard sell, either.

Today the belly boat market is flooded with versions of float tubes basic and deluxe, and the sportsman hankering for close-to-the-water action needn't resort to last-minute raids on tire dealers. One need only observe that most hallowed of sporting traditions, a practice as filled with ritual as tying a parachute dun or rigging up hand-carved decoys. Simply open up a catalog and pull out a credit card.

All belly boats consist of a fabric-covered inner tube. Seats are sewn into the bottom of the tube, with a strap and quick-release snap that connects between the floater's thighs, leaving the legs dangling underwater. Even the most basic models sport a zippered side pocket or two, and a backrest that gets more comfortable the more you pay for the device. Even the stripped down models sport a few D-rings for lashing equipment and grab handles for transport.

These days, though, who rides around in a car with only an AM radio? Not me, and not you, I bet. So it is with float tubes. Load 'em up with options, and you'll float higher, dryer, safer and be able to tote lots more gear. More pockets, better backrests, more gizmos to attach your gadgets to—they're well worth the price once you're on the water. If I had it to do all over again, I'd buy a belly boat with as high a backrest as I could find, the better to keep water from running down my waders each time I leaned back. I'd also opt for a model with a casting apron, not only to keep my flyline out of the water, but to give me an added shelf for duck calls, shotgun shells or sandwiches. And the more D-rings and Velcro strip rod holders, the better.

Before you buy one, however, you should ask yourself a few questions. How much will you use it, and where? Simply to float farm ponds? To pursue the wilderness wood duck, the mud-slough mallard? The further away from shore and sanity you think you're likely to go, the more likely you are to need or want a high-quality rig. Many are also available with a camouflage pattern but unless you hunt ducks or squirrels, you won't need it.

As you might expect, as belly boats have gained popularity, they've also been greatly improved. If you're really serious, you might want to consider one of the high-tech float tubes that come in teardrop shapes (reportedly easier to paddle) or squared shapes (supposedly easier to get in and out

MELISSA McGAW

During spring and summer, *the author (above) uses his float tube to reach little-fished areas that are inaccessible to most anglers. The beaver dam across the mouth of this cove on a Piedmont reservoir prevents boats from fishing its productive waters. Belly boats have been extremely popular with fly fishermen (below), although modifications have to be made to casting techniques to keep back casts off the water.*

EDDIE NICKENS

F. EUGENE HESTER

***This 5-pound bass** fell to a float-tuber who was able to sneak up close to his quarry because of the belly boat's low profile. A bass this large might actually tow the belly boat and angler for some distance before being landed.*

of). There are also tubes larger in the rear than in the front (reported to float more level). Some claim the float tube of the future is the U-Boat, a radically designed floater bubble in which the flotation tube boasts an open bow. This design means getting in and out of the craft doesn't require Houdini-esque bodily contortions, and flipper-kicking is made easier and more efficient. All for a mere $250. Come to think of it, I will do it all over again. Where's my credit card...?

Fishermen get the credit for popularizing float tubes, and the chance to explore new water is still the most common motivation behind a first belly boat buy. But flotation does not equal propulsion, so go ahead and shell out another thirty bucks or so for float tube fins, essential options that are designed to fit over stocking foot waders. The better models have turned-up tips that make walking easier. But with or without them, most float tubers learn to take to the water walking backwards—a direction the belly boat sportsman gets used to.

Most float tubers carry only essential fishing gear, and a couple of small fishing boxes will easily fit into the tube pockets. A fly vest helps, but bring along a shorty vest or leave the bottom pockets empty. They'll eventually get soaked from the water that pools around your waist. Once fishing, you'll soon learn to tailor your casting to float tubing's peculiarities. With no solid ground under your feet, it's more difficult to make long casts with all types of tackle, but give a little flutter kick and you'll be 10 feet closer to target—and in love with the freedom a belly boat brings.

My first float tube fishing was with a flyrod, and while I still enjoy battling pond bream from a belly boat, I must admit that a float tube compounds the flycaster's technical concerns. Backcasts have to be high and loops tight because the distance from rod tip to water surface is cut by half. Fouled line is a pain to untangle, though a stripping apron helps, and untangling flies from trees and shrubs is infinitely more difficult. Still, there is something serene about flyfishing from a tube, a rhythm I've found more pleasing and placid than any other.

When that fly disappears into the maw of a largemouth bass, the roller coaster ride is on. Bobbing along, the tuber is somewhat at the mercy of the size and inclination of a hooked fish. Two years ago while fishing a finger of Harris Lake a big bass towed me 50 feet before I brought him aboard. I'm sure my bubble-skiing act brought a laugh or two from nearby fishermen, but their smiles weren't as big as mine once I had that fish in hand.

I've gotten the same reaction from nearly every other fisherman who cast a disparaging glance my way. I've been pointed at and taunted, in a good-natured manner, but I generally end up answering the question, "Where'd you get that thing, anyway?"

If bemusement is the reaction of the general public to the float-tube fisherman, downright concern and wonderment are in store for the belly-boat gunner. But there are few finer ways to stalk a duck.

"Guerrilla duck-fare," we call it, and other than the customary and usual state and federal regulations, there is but one rule. Use your float tube to get to the swamps and sloughs and potholes where everybody wants to go but no one else can get to.

Few hunters will try this method, and fewer still try it twice. For one thing, it is c-o-l-d. Staying comfortable means staying warm, and by design the belly boat is no efficient insulator. Body heat drips from your dangling legs into the cool water, and a bone-deep chill can set in. I pull on layer upon layer of longjohns and sweatsuits, until I look more like the Pillsbury dough boy.

Cold weather not only saps body heat, it also steals air mass from the inner tube. Whenever you're heading for cool waters, inflate your tube to its maximum pressure. Once it hits cold water, the air in the tube

will compress, leaving you with a float tube that will barely float itself, much less a man with a gun, six decoys, coffee, snacks, insulated waders and three hats. The same principle applies to cold air. Don't store the float tube in the truck bed the night before opening day.

After trying fins modified to fit over insulated waders, and small one-handed paddles, I've come to rely on the push-pole for propulsion when hunting from a float tube. A 12-foot push-pole also serves as a handy anchoring mechanism once you've poled your way across a pothole. In cold lakes, that slender shaft gives at least the illusion of safety, and keeps you from venturing too far from shore.

Once situated, it's clear that there is no finer duck blind than a float tube. The low profile simply does not flare birds. Even so, gunners should be doubly cautious of glare bouncing off the water and lighting up a bare human face. We paint up, and hunker down, near overhanging branches of foliage. Some sort of rain jacket is essential to keep elbows dry, and hot coffee stashed in a tube pocket helps to thaw the spirit.

Sure, it's nuts. But with duck season down to 30 days, we feel the need to pack as much excitement as possible into the dwindling shooting hours. Suspended on the water surface, rocking gently back and forth to send ripples into your decoy rig, it's clear no one truly *deserves* to be called a duck hunter more than the belly-boat gunner.

There are other uses for my float tube —mini-float trips for squirrels comes to mind. Also, if ever I could talk myself into leaving behind the rod or gun, I'm sure I'd discover—as others have—that a belly boat makes a fine, fine photography blind as well. A monopod could double as a short push-pole, and would be essential for closeups of blooming lily pads and pond-side animal life.

None of this has been lost on the makers of float tubes, who have rushed to the drawing boards to enable belly boaters to float drier and move about with greater ease. At least one manufacturer offers an inflatable one-man raft specifically designed for fishermen, and there are even rumors of a motor mount that attaches to the sturdiest of belly boats, capable of handling a tiny kicker and eliminating the need for power fins or push poles. It might also eliminate the need for new shoes or hemmed cuffs, but I'm scouring the catalogs to find one. With such a gadget I could make it across the river and over the beaver dam and around the pond to that little notch in the weeds where the woodies pile up thick as lily pads.

I'd be Mr. It. And wouldn't Lee be lime green then. ⊠

Yes it's cold, *but the belly boat can be a superb duck-gunning platform, as the bag from this hunter and the photographer attests. To be successful, the float-tube duck hunter must use camouflage and cover effectively, and keep low and still. Dressing warmly doesn't hurt, either.*

EDDIE NICKENS

A LOOK AT OUR NEWEST REFUGE

The huge new 111,000-acre Pocosin Lakes National Wildlife Refuge is taking shape in Tyrrell, Washington and Hyde counties, but this one will take a bit of work before it reaches its full potential.

written by Vic Venters
photographed by Ken Taylor

Flooded to prevent fire, *this badly ditched area of the new Pocosin Lakes National Wildlife Refuge was cleared in the 1970s for peat mining. Two severe wildfires swept much of the area in the 1980s. This wooded creek (above) twists through the Upper Alligator River Pocosin, one of the largest and best remaining functioning pocosins on the Albemarle/Pamlico peninsula.*

Under the whirring *chop, chop, chop* of a helicopter blade, the panorama of a ruined landscape unfolds before us. On 20,000-plus acres of the newly formed Pocosin Lakes National Wildlife Refuge, a large piece of pocosin ecosystem has been, for all intents and purposes, annihilated. Deep canals scar the land, leeching water—the lifeblood of a pocosin wetlands—out toward nearby rivers and Albemarle Sound. Great swaths of fire-ravaged ground, their blackness broken only in places by spotty patches of green ferns, lie sullen and hollow of life.

A voice crackles over the chopper's microphone. "You can see how the ground still hasn't recovered from the fires of '85," says Jim Savery, the new refuge manager for Pocosin Lakes Refuge. "It's virtually sterile in places." He points out the affected area by sweeping his hand across the horizon in front of us. The enormity of destruction is humbling—and disturbing.

With the new refuge, the Fish and Wildlife Service has inherited a mixed bag of problems and prizes, the most notable problem being this badly damaged 20,000-acre parcel. It's part of the larger 111,000-acre refuge that previous owners, First Colony Farms, ditched, drained and cleared in the 1970s, a task performed under the banner of bringing economic improvement to one of the poorest regions of North Carolina. Today, there's a different term for it. In the words of the U.S. Fish and Wildlife Service, the affected part of the refuge is now "one of the most hazardous areas for destructive wildfires in the eastern United States."

The reason? Peat — to be exact, over 33 million dry tons of it on the refuge. Once peat completely dries out, it undergoes a chemical change and an irreversible drying process, thereby becoming highly vulnerable to fire. When it burns in conjunction with pocosin shrubs and trees, it's also very difficult to put out. In 1981 and 1985, two disastrous and intense wildfires swept the area, burning three or more feet of the peat soil in places. During the 1985 fire, over

***During the** 1970s and early 1980s, there were grandiose plans for mining peat all along the Albemarle/Pamlico peninsula. Pocosins were ditched, drained, then stripped clean with heavy machinery like these bulldozers. The peat was to be mined and burned in peat-fired electric plants. Conservationists feared environmental havoc, but falling energy prices, regulations and money problems ended mining plans—at least for now.*

95,000 acres were torched. Reflooding the dried peat helps, but the danger remains.

The fire hazard haunts the refuge, a legacy of the 1970s when pocosin draining and clearing was proceeding at breakneck pace in eastern North Carolina. Back then, soaring oil costs led to grandiose plans to mine the vast pocosin peat deposits along the Albemarle-Pamlico Peninsula. Many pocosins were drained and the peat was to be dried and burned as a cheap source of fuel in peat-fired electric plants. Advocates argued it would provide inexpensive electricity, jobs and industry and add to the local tax base. A sort of TVA of organic soil.

Those positive points remain debatable, but whatever the outcome, it would have come at a high cost to eastern North Carolina's remaining wetland habitat. Immediate mining plans in the early 1980s, however, were derailed when plunging energy costs, stricter wetland laws, environmental issues and financial problems halted mining timetables. First Colony Farms, a chief proponent of peat mining, went bankrupt in the mid-1980s. A few peat mining proposals continued to smolder on, however. Then, in 1989, the 104,000 acres owned by First Colony went into a bankruptcy sale. The Virginia-based Conservation Fund, a land conservation group attempting to buy the land, was suddenly outbid by a Japanese corporation intent on mining the peat and establishing a generating plant.

Faced with litigation from environmental groups like the N.C. Wildlife Federation and the Southern Environmental Law Center, and hit with court decisions that ruled in favor of wetland status for illegally drained pocosins, the Japanese relented, thus allowing the Conservation Fund, with the financial backing of the Mellon Foundation, to purchase the First Colony tract in late 1989 for $8.8 million.

The new refuge became reality in June 1990 when the Conservation Fund donated the land to the U.S. Fish and Wildlife Service in one of the largest land donations ever made to the federal government. Pocosin Lakes National Wildlife Refuge was created by combining about 93,000 acres of the First Colony tract with the existing 12,350-acre Pungo National Wildlife Refuge. (The remaining First Colony acreage was added to the Alligator River National Wildlife Refuge.) A nearby 6,000-acre tract that was formerly part of the Alligator River National Wildlife Refuge was also incorporated into Pocosin Lakes Refuge management.

The first issues confronting the Service are how to best manage 20,000 acres of horribly damaged wetlands, and how to control the attendant 90-mile maze of drainage canals, many with water-control structures badly in need of repair. Expensive fire-control measures—the helicopter we rode in, and fire crews—are needed on the refuge in order to combat potential wildfires.

It should be emphasized that the new Pocosin Lakes Refuge is still a real gem, albeit a diamond in the rough. The 111,000-acre refuge contains some of the best remaining large pocosins in eastern North Carolina and valuable wetlands that far exceed the damaged 20,000-acre pocosin area. With its numerous natural lakes, it also is home to some of the finest habitat for wintering waterfowl in the state. By preserving extensive wetlands, the new refuge will also provide long-term watershed protection for nearby lakes, streams, rivers and Albemarle Sound, thus helping protect the productivity of local fisheries. And the nearby town of Columbia and surrounding Tyrrell County should profit from a proposed refuge visitor's center that will pump increased tourist traffic—and badly needed dollars—into the area.

Virtually all of the land on the new refuge is, or was, at one time, pocosin. The term pocosin is an old Algonquin Indian word meaning "swamp on a hill," still an accurate description of the terrain. The pocosins of the Albemarle Pamlico Peninsula were once known as the East Dismal Swamp and were formed about 10,000 years ago when sea-levels were as much as 75 to 100 feet below present levels. At that time, Ice Age glaciers to the north held much of the earth's water, lowering the seas. What is now eastern North Carolina was covered with great hardwood forests, and the area was dissected and drained by rivers. As the

northern glaciers melted and receded, sea levels began to rise and currents in local rivers and streams slowed, carrying less and less sediment toward the sea.

Ancient streambeds were gradually blocked with sediments, flooding water into surrounding forests. Local vegetation changed from upland hardwoods to cypress-gum swamps. As vegetation and dead trees fell into the acidic swamps, they only partially decayed in the water-saturated, oxygen-starved environment, thus forming the organic soil known as peat. Over the eons, layers of organic material (peat) built up and gradually formed pocosins. In this highly acidic, moist environment, what grows today are scattered pond pines and shrub bog species like fetterbush, gallberry and titi. In places, the peat soil layer is over 8 feet deep.

In their unaltered state, pocosins are valuable to wildlife because they represent vast chunks of undisturbed habitat, and they are particularly important to wildlife species that have not been able to adapt to living in smaller, broken wooded areas. On the Pocosin Lakes Refuge, the best remaining pocosin habitat lies on the eastern boundary, near the Alligator River. Only a few man-made canals—seemingly old—violate the interior of this 30,000-acre tract. This section is known as the Upper Alligator River Pocosin and has been evaluated by researchers as being the best of unmodified or slightly modified pocosins on the Albemarle Pamlico Peninsula.

Pocosins also fulfill important water-quality control functions by filtering pollution and sediment from surface water, recharging groundwater supplies and providing flood control. Over 22,000 acres of the refuge drain into nearby Pungo River, and parts of the refuge also border Alligator and Scuppernong rivers. The fishing in all three rivers is considered excellent. With the refuge offering considerable watershed protection to these rivers, the fisheries should remain healthy—barring other influences.

The refuge also encompasses about 2,000 acres along the Scuppernong river, tracts that contain sizeable stands of Atlantic white cedar (juniper). Juniper has become increasingly scarce in North Carolina as most stocks have long since been logged. Currently, both the Conservation Fund and the North Carolina Nature Conservancy are negotiating with private landowners to add several additional juniper tracts along the Scuppernong River to the refuge.

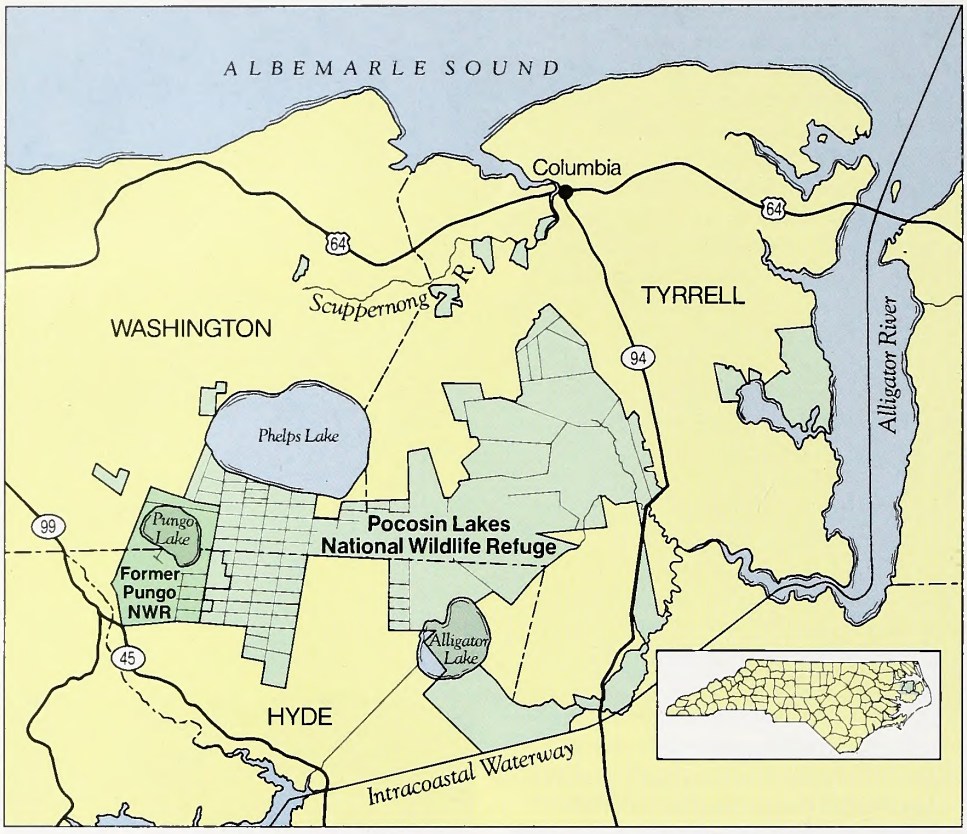
In addition to its wetland habitat, the refuge contains valuable natural lakes. The best known is the 16,600-acre Lake Phelps; 4.5 miles of the lake's shoreline lies within the new refuge. While the body of the lake is actually owned and managed by the state of North Carolina through its ownership of nearby Pettigrew State Park, the addition of those shoreline miles to federal property will preserve the lake from excessive residential development.

Phelps is well-known to fishermen who flock to its productive waters. It's also home to the federally endangered Waccamaw killifish. Lake Waccamaw, in southeastern North Carolina, is the only other location in the world where this tiny fish species is known to exist. The red-cockaded woodpecker, another federally endangered species, has been observed near the refuge and bald eagles have been sighted on occasion near Phelps.

The new refuge also contains more than 4,000 acres of the 4,800-acre New Lake and all of Pungo Lake. While these two lakes are highly acidic and offer almost no fishing, their remote location provides excellent habitat for wintering waterfowl. Swans, snow geese and Canada geese, in particular, use the lakes for roosting refuges in the winter, while nearby grain fields provide plenty of food for the migrating waterfowl.

The former Pungo National Wildlife Refuge tract, which includes the 2,800-acre Pungo Lake and an additional 9,500 acres of farmland, marsh and pocosin, will continue to be intensively managed for wintering waterfowl. Each year, over 1,200 acres of croplands are planted to provide sources of high-protein food for visiting swans, ducks and geese. Biologists also manipulate water levels for optimum production of natural

Some areas of the refuge *were more badly burned than others. In some areas of the refuge, pocosin shrubs and grass have returned, creating good habitat for quail and white-tailed deer. Jim Savery (bottom) is the new refuge manager for Pocosin Lakes. Here, he sits in a field planted with grain crops that will provide waterfowl with high protein forage during winter months.*



***The 111,000-acre** Pocosin Lakes National Wildlife Refuge was created by combining land from the old Pungo National Wildlife Refuge and the Alligator River National Wildlife Refuge with 93,000-acres donated to the U.S. Fish and Wildlife Service by the Conservation Fund. The grid of lines within the refuge represents drainage canals. Aside from preserving wetlands, the new refuge offers excellent habitat for wintering waterfowl like these tundra swans.*

waterfowl foods and have erected nesting boxes for the refuge's breeding population of wood ducks.

An archery and permit gun hunt for deer is currently allowed on the old Pungo Refuge tract. Hunting is allowed on the Pungo tract to help control the large white-tailed deer herds that eat a lot of the grain crops planted for waterfowl. Currently, Savery is writing a hunting management plan that may allow parts of the new refuge to be opened to additional hunting opportunities—at least for deer and small game. Before opening the refuge to further public hunting, an environmental assessment must first be completed. "Deer are over-populated in the area," said David Kitts, a wildlife biologist at the refuge. "Pocosin Lakes could offer excellent deer and small-game hunting. But with waterfowl populations low, don't count on extensive waterfowl hunting on the refuge. The birds need to use these lakes unmolested."

Managing the refuge's waterfowl and other wildlife will be a relatively simple task compared to repairing and maintaining the damaged areas of the refuge, at least initially. Fire control on the flammable peat is a major ongoing concern, especially during the dry seasons of spring and late summer. "It would be pretty scary if a fire got out of control here," Savery explained. "On some of the drained pocosins, you've got lots of broomsedge coming back. If that catches fire with a good wind blowing, I doubt you could run fast enough to keep up with it. If the peat and the fuel in those pocosins blow up, we've got trouble."

Although the fire crews and a helicopter can help, the best prevention for wildfires will come by manipulating water levels in the canals to keep the drained areas flooded. This task, unfortunately, will be easier said than done. "Right now, we're trying to figure out how this system of canals and ditches works—which way the water flows and how the canals interact with each other," Savery explained. "It's a real mess right now. We don't even know how many water control structures there are—nobody does. We've got some that are rotten, some that are ready to blow out and some that are leaking."

When fires burned out of control in 1985, so much peat soil was burned away in places that the water's flow in the canals actually changed directions. "We've also got to keep the drained areas wet without flooding out neighboring landowners," Savery explained. "This problem dates back to what the previous landowners did.

It's going to be a complex task to get the canal system in order, but it has to be our first priority. We've got years of hard work in front of us before everything is operating as it should."

Some of the drained pocosin on the refuge is beginning to revert to shrubs and pond pines, typical pocosin vegetation. On other badly burned and drained areas, however, the land is still a virtual wildlife desert. Nothing but a few ferns are visible. "In some of the sterile, burned areas we are going to be experimenting with reforestation to see what species we may be able to grow there," Savery said. "For instance, Weyerhaeuser will be putting in a plot of Atlantic white cedar to see if it can be grown on the drained land."

Because of the constant fire hazard and current minimal wildlife value of some of the severely affected pocosins, some have proposed that peat mining on the damaged tract be allowed. Once the peat is removed, they say, either crops or waterfowl impoundments could be constructed. This proposal, however, did not sit well with many environmentalists who argued that peat mining could increase freshwater drainage into nearby rivers, lakes and the already stressed Albemarle Sound, thus jeopardizing valuable fisheries.

For the time being, the peat mining proposal appears dead in the water. With the Alligator River and Pocosin Lakes national wildlife refuges, the federal government now controls most of North Carolina's exploitable peat resources. When the Conservation Fund transferred the land to the Fish and Wildlife Service, it also transferred mining rights as well. Technically, this gives the Feds the ability to lease mining rights to an interested mining company but this appears unlikely. "There are so many environmental regulations now that it would be very, very difficult for anyone to conduct mining—even if the Service would allow it," Savery said. "Our plans do not currently include peat mining."

Does this mean there will never be peat mining? Regardless of its current wetland status, the peat is a significant economic resource. The region in which the peat is found remains North Carolina's poorest. Combined, those two factors mean there will always be some local sentiment to exploit this resource. If wetland laws are rewritten so that a pocosin's wetland status is compromised, then the peat mining issue may once again flare up, though not necessarily on the the local wildlife refuges.

Still, for now, the patient remains safe, even if not completely healthy. It will be a long road to recovery, but at least it's in the right hands now. ☒

Columbia Seeks Refuge Center

When national wildlife refuges come to an area, relationships often aren't good between local citizens and the Feds. The town of Columbia in Tyrrell County is proving that it doesn't have to be that way.

Why would the town managers of Columbia in Tyrrell County—the poorest county in the state—be excited about a new federal wildlife refuge that gobbled up 49,000 acres of county land? After all, Pocosin Lakes Refuge represents land that has been removed from tax rolls, land that is no longer available for industry and jobs, land on which peat mining is probably no longer possible. That's three strikes agin' it, which usually means out!

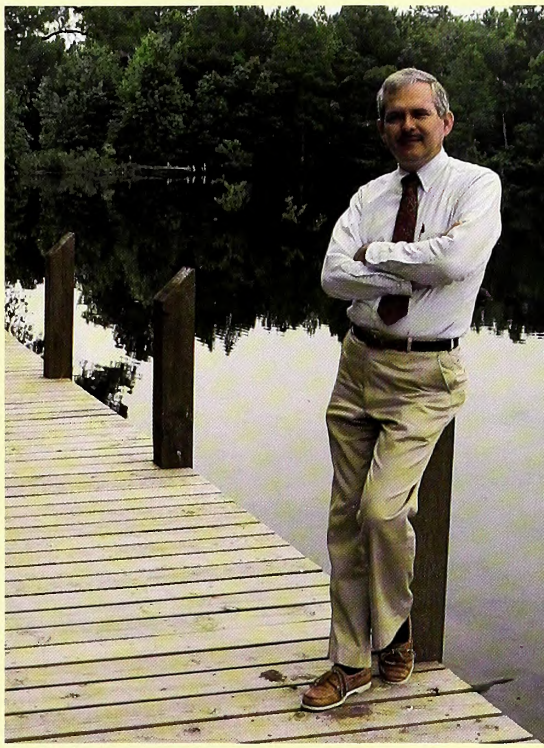
The truth is, Columbia sees "gold" in the refuge, but not in the old sense of exploiting resources. Set on the cypress- and juniper-lined banks of the Scuppernong River, this quaint little village is renovating its waterfront, and a proposed visitor's center for the new refuge will hopefully serve as the centerpiece of the renovation efforts.

A new waterfront refuge center may seem unremarkable at first glance, until you realize that 1.3 million people—beachbound tourists—will pass by the center and through Columbia each year on Route 64 on their way to Nags Head nirvana. You don't have to siphon off more than a small percentage of a million cash-heavy travelers to know why Columbia sees more hope in its future than perhaps anytime this century.

"Sure it would be nice to have a lot of large employers and jobs around here," said J.D. Brickhouse, county administrator for Tyrrell County. "But without a larger and more skilled workforce, we are not going to get the IBMs or GEs. We've got to look at the situation realistically.

"It just makes good sense for us to support the Fish and Wildlife Service here," he added. "We are going to capitalize on our water resources—the Albemarle, Phelps Lake, the Alligator and Scuppernong Rivers—in an environmentally responsible way."

Together, Columbia, Tyrrell County and the U.S. Fish and Wildlife Service have proposed a visitor's center that will provide a history of pocosin wetlands and information on the new Pocosin Lakes National Wildlife Refuge, other surrounding refuges like Mattamuskeet and environmental-education programs. The planned center would be linked to a city visitor's center and a nature area, a working waterfront, restaurants, shops and a tour boat. Construction has begun on a pier, but the refuge visitor's center is contingent on a $3 million appropriation from Congress.



J. D. Brickhouse
County Administrator for Tyrrell County

The spirit of cooperation has pleased the Feds. Says refuge manager Savery, "I've worked in a a lot of refuges around the country and often relationships with locals aren't that good. But this group in Columbia has worked hard and the people have stood behind everything they ever said they would do. If all this goes through it can be a real success story, for both the environment and the town."

That sounds more like a home run.

TIM BLACK

Return of the Natives

Putting animals back into habitats is harder than taking them out, but that's exactly what's happening in the Great Smoky Mountains National Park. The reintroduction of red wolves this summer is only the latest step.

by Lawrence S. Earley

When the subject is Great Smoky Mountains National Park, it's sometimes hard to see the forest for the trees, so to speak. To be more precise, 135 different kinds of trees, as many as in all of northern Europe. And the numbers don't stop there: of flowering plants there are 1,534 species; ferns, 53; mammals, 71; reptiles, 35; amphibians, 39; birds, 236 and fish, 46. The Smokies encompass a biological treasure almost beyond reckoning. It's a naturalist's paradise, a World Biosphere Reserve, one of the greatest and most species-rich wildernesses in the country.

Yet aside from revealing an accountant's mentality, such enumeration is deceiving, for there are a lot of strands missing from the Smokies' extraordinary tapestry of life. The chestnut tree, once such an important part of the forest, is gone, wiped out by an exotic blight that man introduced earlier in the century. You won't hear the howl of a gray wolf, either, or see the proud gait of an elk, two extirpated natives of the southern Appalachians. The woods bison has been exterminated and if there are any cougars roaming these rock-strewn slopes they're almost surely not the native eastern species that once lived here.

Quietly, however, so quietly that most people don't know it's happening, some gaps are being filled. Since 1984, the National Park Service has reintroduced six wildlife species to their native range in the Smokies. A modest start, to be sure, yet the program shows a steady-as-she-goes spirit. This summer Park and U.S. Fish and Wildlife biologists will release a family of red wolves into the Smokies to cap an intense and successful year-long effort to sell the idea to a public notoriously spooked by four-legged, mammalian predators.

Restoring animals to a landscape is a belated reversal of form for a species—*Homo sapiens*—who has specialized in removing them. Though we haven't completely changed our stripes—species are becoming extinct worldwide at a rate of 40 a day—Americans are steadily understanding

***Blue mist hangs over** the valleys of the Great Smokies, the largest wilderness area on the East Coast. Many species extirpated from the mountains by settlers are being reintroduced today in an ambitious plan that includes the red wolf.*

TIM BLACK

The size of the park *and the remoteness of many areas within it are the keys to the Smokies's choice as a reintroduction site for peregrine falcons, spotfin chubs, the yellowfin and smoky madtoms, and river otters.*

the importance of species diversity, and our recent laws reflect this awareness. The impetus for reintroductions dates from the Endangered Species Act of 1973 which pledged the efforts of federal agencies to the goal of conserving species. The Park Service has been doing its part by identifying endangered species and by restoring habitats.

"The Park Service's mandate is to protect the wildlife and the plants that we currently have and, where feasible, reintroduce those that have been lost to the hand of man," says Bob Miller, public affairs specialist at the Smokies National Park. Among the endangered species released have been the peregrine falcon, the spotfin chub and the yellowfin madtom. River otters and the smoky madtom have also been restored to Smokies habitats, and efforts are underway to expand the range of native brook trout in the Park's streams.

The reintroduction program has not been free of controversy, even among scientists. Why squander limited resources on new species in the park, some ask, when there's not enough to manage existing species? Other criticisms have focused on particular animals being reintroduced. For example, biologists have questioned the goal of eradicating established rainbow and brown trout fisheries on some creeks to enhance brook trout habitat. And there's always been a chorus of critics who doubt that red wolves ever roamed as far north as North Carolina in the first place.

At first glance, the red wolf and the Smokies seem to be made for each other. With 517,000 acres, the park is the largest wilderness on the East Coast, the sole remnant of the great forest that once stretched from the Atlantic to the Mississippi, the forest that our Puritan forefathers feared and called a "howling wilderness."

For its part, the red wolf is one of the most endangered species in the world. One of three canids in the continental United States—the others being the coyote and the gray wolf—the red wolf historically roamed throughout the Southeast, but as settlers moved in, the red wolf was extirpated. By the middle of the 20th century, the few remaining red wolves were crossbreeding with coyotes, threatening the species' genetic viability. A recovery effort for the wolf was begun in the mid-1970s. Out of 400 canids trapped, 17 turned out to be

pure-bred red wolves. These "founders" have been responsible for raising the population to over 165, and biologists hope that the red wolves will reach a stable population of about 550, 325 of which will be scattered among 30 institutions for captive-breeding purposes, and 225 released in the wild.

Wilderness plus endangered species—it's a match made in heaven. But like most marriages, this one needed the blessing of witnesses before it could be legalized, in this case the local populace. And people generally don't look at wolves in the same way they look at the "warm fuzzies," as Bob Miller describes the otters, falcons and chubs that have been released in the park so far. Wolves are predators and they come with a bad rap, most of it based on ignorance and fear. It's a potent combination. In 1984, for example, a proposal to reintroduce red wolves in Land Between the Lakes National Recreation Area, in western Tennessee, was shelved when it met with intense local opposition. Bad feelings lingered for years. Proposals to reintroduce gray wolves in Yellowstone National Park have also met with similar assaults from cattleman and farmers.

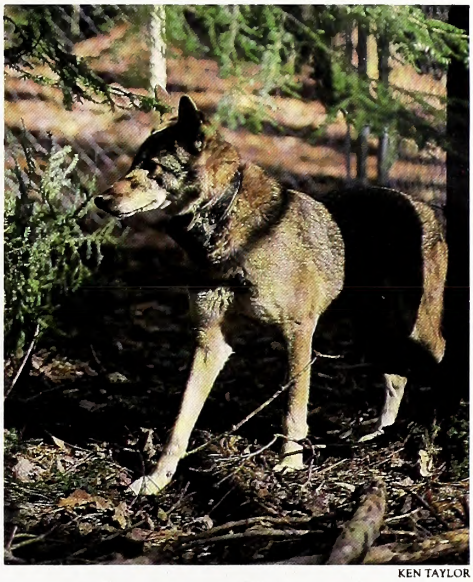
By contrast, the Park Service's negotiations with local landowners have been a model of civility. "Most people say, 'we'll wait and see,' " says Miller. "And that's all we hope for. I don't expect them to carry us out on their shoulders, but they're not running us out on a rail, either."

How did the Smokies' wolf reintroduction win such community support, while at Yellowstone threats and counter threats are the order of the day? For one thing, the small, shy and retiring red wolf is not as threatening as the larger gray wolf. For another, eastern Tennessee and western North Carolina are not major cattle or sheep-raising areas so there's less organized resistance to a predator that some see as a threat.

However, the Park and Fish and Wildlife personnel may have also done a better job selling the program than their counterparts at Yellowstone and Land Between the Lakes. Their campaign was based on the successful education effort that preceded the release of red wolves into Alligator River National Wildlife Refuge in 1986. One of the key players in that campaign was Warren Parker, now retired but until 1990 the red wolf coordinator for the U.S. Fish and Wildlife Service in Asheville, the lead agency in endangered species reintroductions.

"The key to a successful reintroduction program is the sensitive and skilled people who go out and negotiate with the local public, about what red wolves are and what they are not," says Parker. "We know they don't chase school buses and prey on school children. They don't terrorize local people."

That was part of the message the Fish and Wildlife Service carried to the people of Tyrrell, Dare and Hyde counties for about a year before the wolves were released. It worked. The people were calmed and biologists gained the respect and the cooperation of local hunters and farmers. "In four years, most people around Alligator River haven't even known the wolves were there," says Parker. "I feared we'd lose a couple of wolves to deer hunters, but as it turned out, they were some of our staunchest allies. No wolves have been killed on the refuge, although one was killed off the refuge." Biologists at Alligator River expect three to four litters of wolves this spring, bringing the total population to 25.



KEN TAYLOR

The wolves will wear *radio collars to enable their movements to be tracked by researchers. The main question tested by the experimental release is whether red wolves will drive out competing coyotes. If wolves resist interbreeding with coyotes, more red wolves will be reintroduced in 1992.*

Biologists ready a red wolf *after its delivery to an acclimation pen in the Smokies in January 1991. Two pairs of the wolves were brought to the park from captive-breeding centers around the country. One of the pairs produced five pups this spring, and the family will be released in August.*

KEN TAYLOR

Buoyed by this success, the Smokies' education and PR campaign began in Washington, with briefings for both congressional and senatorial staffs. At the state level, contacts were made with the governors of both North Carolina and Tennessee and with the wildlife agencies of both states. "From there, they passed the baton to Warren Parker and me," says Bob Miller. "I talked to livestock owners, farmers, farm bureaus, hunters organizations and a lot of regulatory groups. Between us, we talked to every Kiwanis and Rotary club north and south of the park."

Two assurances in particular seemed to carry a lot of weight among local landowners. One was that the adult wolves will be outfitted with state-of-the-art recapture collars which will make it easier to keep them within the park boundaries. Two darts, fired by radio command, can tranquilize a wandering wolf. "The collar has tremendous application for reintroductions of endangered species, especially predator

LuRAY PARKER

Other animals *being considered for the reintroduction to the Smokies are the bison and the elk. Elk were hunted out of the Appalachians in the early 19th century, while the bison had disappeared by the middle of the previous century. At the moment, researchers are considering how both animals would fare in the park. Neither animal is certain to be restored.*

species," says Parker, "because it helps build public confidence in our abilities to control them."

Park officials also made use of a little known provision of the Endangered Species Act by which red wolves released in the Smokies will be considered "experimental" and "non-essential." What this means is that the wolves will receive less protection than they normally would as endangered species. Unresolved at this writing is exactly how limited this protection is. According to Julius Johnson of the Tennessee Farm Bureau, landowners were assured that if they found a wolf chewing on their prize heifer, they could legally kill the wolf. But according to the proposed regulations under review last spring, livestock owners would first have to notify Park personnel before they could draw back the hammer. Some landowners feel deceived. "Do you have time to run to a distant phone when you have the possibility of saving a $5,000 animal?" asks Johnson. "We've been duped."

Gary Henry, the current red wolf coordinator with the Fish and Wildlife Service in Asheville, explains that the regulation is trying to establish a fine line between granting too much freedom and not enough. "You want to allow the landowner to respond to what in fact is a threat," says Henry, "but if you open it up to where he doesn't have to jump through any hoops, you're opening it up to where he could claim something as a threat that is not." Both Johnson and Henry agree that the proposed rule may well be changed before the wolves are released, so these differences may disappear in time.

The release of the wolves—two adults and five pups—in Cades Cove this summer will be the first phase of a two-phase operation. In the first phase, biologists will study the success the wolves have in interacting with a growing coyote population in the area. The hope is that the wolves will establish territories and force the coyotes out. "If we can demonstrate the success of this over a 12- to 15-month period," says Parker, "then the Park Service and the Fish and Wildlife Service, in cooperation with both state wildlife agencies, will be ready for the second phase." This would be a full reintroduction of the red wolf into the Smokies, much as has been done at Alligator River Wildlife Refuge.

Other candidates for reintroduction to the Smokies include the fisher, the elk and the bison. All were found in the southern Appalachians in historical times, yet all of them have problems associated with them.

- ***Fisher.*** The fisher is a fox-sized mammal, native to the forests of northern North America, that reportedly ranged as far south as the Smokies (see "Second Chance for Fishers?" p. 20). Fishers eat some squirrels, however, an appetite that conflicts with the Park's management plan for its

LuRAY PARKER

small population of endangered northern flying squirrels.

- ***Elk.*** Eastern elk were hunted out of the Appalachians before the mid-19th century and a few were stocked in various mountain locations earlier this century. Proposals to reintroduce elk are being studied, but biologists are concerned that elk could become fatally infected by a parasitic brain worm carried by whitetailed deer in the area. There is also some dispute over the habitat requirements of the eastern elk, and whether the Park could sustain another highly mobile grazer.
- ***Bison.*** Some consideration has been given to introducing plains bison into the Smokies to replace the woods bison that roamed the valleys of the Piedmont and mountains in historical times. One problem is that it's a large creature with a nasty disposition. Another is that it may not be the same species as the woods bison, although, according to Miller, there might be some justification for its presence nonetheless. "If you don't have what you had before, functionally you could put in the next best thing. It's sort of where we are with the red wolf. The subspecies that we're putting in this summer wasn't really the one that was here; the subspecies is really the Mississippi Valley red wolf (*Canis rufus gregoryi*), not the Florida red wolf which is extinct. So you could probably make the same argument for bison."

In that case, what about the possibility of reintroducing cougars or even gray wolves, two other mountain predators missing from the mountains today? "We're not contemplating the gray wolf at this point," says Miller. "But as far as the panther goes, our policy dictates that we have to consider it, and consider it is all we're doing."

Miller admits that there are some limits to what Park personnel can do and even ought to do with reintroductions. Two biologists are responsible for managing all the Smokies' fish and wildlife, including the newly restored species. "We only have the personnel and the time to manage so many species," he says. "Plus you have to look at how many variables you can handle. If you bring in bison and elk, and you're bringing in wolves at the same time, all the variables are getting jumbled up. You can only assess so much simultaneously if you're going to get meaningful data on how things are working."

It takes a long, long view to see the tremendous significance of the experiment that's taking place in the Smokies. It's a lot easier to take a species out of a habitat than to put one back in, but the Park Service is betting the future on its efforts. For some species, it's the only chance they've got. ☐

Second Chance For Fishers?

It's been 150 years since the last fisher lived in the high southern Appalachians, but these large, weasel-like mammals may get another chance in the Great Smokies.

written and photographed by Roger A. Powell

The red spruce forest was deep green and brown in the afternoon shadows of a June day in 1987. Paul Wagner and I hiked along the Appalachian Trail in Great Smoky Mountains National Park carrying packs loaded with research and camping gear. An occasional red squirrel chewed us out for hiking into its territory and we noted a fox scat on a rock in the trail. The fox scat was filled with the bones and fur of a cottontail rabbit. This old forest was filled with life, much of it hidden from our view, but what interested us most that day was a mammal that had not seen these mountain forests for 150 years. We were trying to warm up the tracks of the fisher, a large member of the weasel family.

Records of the early natural history explorers of North America refer to fishers in the Southern Appalachians. John James Audubon and the Reverend Bachman talked to hunters and trappers who had killed fishers in the North Carolina and Tennessee mountains; Bachman apparently saw carcasses or pelts of such fishers. And the remains of fishers have been found in archaeological sites in the South beyond the mountains, undoubtedly traded because of the value placed on their fine pelts.

It was the fishers' pelt that led to its disappearance from the Southern Appalachians. The last records of fishers in the Southern Appalachians date from the 1830s. Fishers are generally dark brown but they have glossy black legs and tails and golden or silver-tipped hairs on their necks and heads. The winter fur on a fisher is silky and smooth, especially that on a female, and has been so prized that it has sometimes been called American sable. Females generally weigh about half as much as males, however, usually about 4 to 5 pounds. Males usually weigh less than 10 pounds. Fishers' pelts have always commanded high prices in the fur trade, and in recent years a prime pelt from an adult female fisher could bring a trapper hundreds of dollars. But fishers are a northern mammal and the Southern Appalachians' high elevation forests were the fishers' only reach into the South. Their populations in these mountains were never high and their habitat was limited. Because their reproductive output is also very low, fishers in the mountains were in a precarious position and were quickly overtrapped and hunted out.

***The fisher preys** mostly on rabbits, birds, squirrels and other small animals. Its restoration to the park may depend on whether it will affect the park's small population of endangered northern flying squirrels.*

The habitats most important to fishers were undoubtedly the high-elevation red spruce and Fraser fir forests and the northern hardwood forests just below them. As Paul and I hiked towards Peck's Corners, I noted how the forests were similar in many ways to the forests in Upper Peninsula Michigan and northern Minnesota where I had studied fishers in the 1970s. The forests of Upper Peninsula Michigan are northern hardwoods mixed with hemlocks and white pines. The yellow birches and sugar and red maples mixed with red spruce and occasional white pines and hemlocks along the Appalachian Trail brought those forests clearly back to mind. Except for the topography, I could almost imagine myself in Michigan's Sylvania Track, a small wilderness tract of virgin mixed northern hardwoods and conifers. Up on the high ridges and mountain tops, the red spruce forests reminded me of the boreal forests of northern Minnesota and Ontario. This was fisher country as I knew it.

Paul was a technician who would work for me that summer and fall to collect data on the high-elevation forests and the mammals living in them in Great Smoky Mountains National Park. He and I would measure and count trees of different species in designated sites to make comparisons to forests where fishers are presently found. We would also live-trap small mammals to document potential fisher food and note the track and sign of predators that presently eat those small mammals. These data, collected over a few years to determine yearly fluctuations, were to be used to evaluate whether fishers could be returned to the Park.

The National Park Service is committed to maintaining the original forests and animal communites in the Smokies, but must work within limitations imposed by human-caused changes in the forests, restricted funds, and sometimes conflicting responsibilities. Thus, the Park Service wishes to reintroduce extirpated species like the fisher but must first learn the chances of success. Furthermore, high-elevation forests in Great Smoky Mountains National Park have changed in recent years as Fraser firs, and now red spruce, have died. This has led to openings in the forest canopy, which lead to dense new growth of ground vegetation and young trees. I needed to be able to tell the Park Service whether such changes would be important to fishers.

Fishers are predators that eat a wide variety of mammals and birds. They are known to eat squirrels, including flying squirrels, so I also needed to be able to tell the Park Service whether reintroduced fishers would likely affect the Park's popu-

lation of the endangered northern flying squirrel. The Park Service mandate to return parks to natural habitat with original animal populations might conflict then with its mandate to protect endangered species.

That evening, Paul and I poured over maps by the light of a miner's lamp in the remote Park Service cabin near Peck's Corners. Because Paul would be in the woods far more than I, he needed to understand the research design clearly and to know where our research sites were, how they could be reached, and why those sites were important. All of our sites were off the beaten trails because that is where fishers will go if returned to the Park. The research sites included all three important high-elevation forest habitats: spruce-fir, northern hardwoods, and beech gaps. Bushwhacking to some sites would be difficult, but Paul and I knew that getting to know the forest from a fisher's point of view would have rewards.

The next morning we left live-traps and other equipment in the cabin and hiked on to Mt. Guyot. Along the way, I thought of the fishers I had studied in the northern forests of the Midwest and how they might live here in these mountains. Fishers released in the Smokies would have to come from Minnesota, New York, Ontario or some other place with a healthy population. The best time to release them would be late summer, after youngsters had left their mothers. The worst time to release them would be in mid-winter, when the breeding season would be starting and males would want to wander over great distances to find females. We would want the new fishers to settle down near where they were released, because we'd chose release sites that had good habitat for them.

I knew that all of the new adult females we might release in the Smokies would already be pregnant. No trick to that since adult female fishers are pregnant nearly all their lives because they breed only a week or so after giving birth in March or April. Development of a fisher embryo is interrupted at an early stage, when the embryo is a ball of a few hundred cells. It then remains dormant for over 10 months before implanting in its mother's uterus and continuing with an otherwise normal development. Thus, despite the long pregnancy, female fishers give birth to quite undeveloped young that have ears and eyes closed and only a sparse covering of downy fur.

Two or three young will be born high in a hollow tree or possibly in a hole in the ground at the base of a tree. Young fishers nurse for almost two months and will not leave the nests where they were born until past that age. Even then, they continue to be dependent on their mothers until early fall. Female fishers breed for the first time when 1 year old, but because of delayed implantation do not give birth for the first time until they are 2. Coupled with an average litter size of just over two, this means that fisher populations do not have the potential for rapid growth and they decline quickly if overharvested. This is a part of the reason that they were extirpated from the Southern Appalachians in the early 1800s.

Male fishers also reach adulthood and breed for the first time when 2 years old. During the two months before the breeding season, adult males gradually increase their activity levels, and by the beginning of the breeding season they travel long distances each day looking for adult females. This is the only time that males and females are found together. During the rest of the year, each individual fisher is largely solitary, except for females with kits. In most places where they have been studied, fishers maintain individual home ranges that do not overlap with the home ranges of other fishers of the same sex. These have been called intrasexual territories. Recent theoretical research indicates that fishers space themselves in this manner because of three interacting factors. First, their prey populations are not affected much by predation and, second, prey become hard to catch once a fisher has been detected nearby. Finally, it is good to know the whereabouts of at least one member of the opposite sex.

If prey were easy to catch and predation significantly reduced prey populations, then it would be best for each fisher to have its own territory and not share it with another fisher. But prey populations for fishers are high; there are lots of mice, rabbits, squirrels and birds in the woods and the number that one fisher eats makes little difference to the total number in the woods. What is most important to a fisher with these prey is that each prey individual is difficult to catch and only by being in the right place at the right time will a fisher get a meal. This means that by sharing its territory with one other fisher, few potential meals are lost. It appears that fishers are willing to give up those few meals in exchange for knowing where to find a member of the opposite sex during the breeding season. Each fisher will breed with more than one member of the opposite sex if given the opportunity, but having that first breeding guaranteed seems to be important.

Exactly what fishers will eat if returned to the Smokies is not known but they will most likely eat what they find easiest to catch. This means that common prey that don't have special techniques for avoiding predators are likely prey. Cottontail rabbits, voles and mice will probably be the most common prey. Fishers will also likely prey on squirrels and ruffed grouse they catch on the ground. Despite the widespread belief by early natural history explorers that fishers were the most agile of all mammals in the trees, fishers hunt almost exclusively on the ground and have little chance of catching any prey in trees.

Fishers will also readily eat carrion. I suspect that white-tailed deer and wild pigs that die during winter may be important to fishers. Pigs that get trapped by snow at high elevations may turn out to be a uniquely important food. No where else are fishers

***The fisher preys** mostly on rabbits, birds, squirrels and other small animals. Its restoration to the park may depend on whether it will affect the park's small population of endangered northern flying squirrels.*

***A species native** to the mixed evergreen and hardwood forests of the north, the fisher historically inhabited the Appalachian spine in small numbers possibly as far south as the Smokies. Researchers may restore this predator to the park.*

found where there are wild pigs. One prey species not found in the Southern Appalachians, but frequently eaten by fishers in the Northeast and Midwest, is the porcupine.

Fishers eat similar prey as foxes and bobcats, but hunt in different ways. Fishers go under and through logs and tangles of branches, and also go down holes. In the Upper Midwest and Northeast, fishers coexist with red foxes, bobcats and coyotes with no trouble.

In January 1987, NCSU graduate student Erran Seaman and I snowshoed into Mt. LeConte and spent a few days counting tracks of potential fisher prey and of predators. The snow was fresh and quickly began melting, so we found it impossible to collect the same sort of data that I had collected on long-lasting snow in Michigan. Nonetheless the tracks of potential fisher prey revealed the presence of species similar to those I had documented in fisher country in Michigan.

During the summer of 1987 Paul and I established 13 research sites for live-trapping small mammals and over 30 additional sites to take forest measurements. Only in October did Paul finish live-trapping at the last site. In 1988 Mike Lusk, a graduate student at North Carolina State University, returned to each site, and in 1989 Mike Steele returned again. Steele did post-doctoral research with me after receiving his PhD from Wake Forest University, and he brought to the project expertise in catching northern flying squirrels.

So far, the results of all this work appear good for the fisher. The sites that Paul and I struggled to establish in 1986 told us not only what small mammals were found in the different types of forest, but also how populations differed from place to place within the types of forest each year. Furthermore, we learned how populations of prey changed from year to year. I compared these results to a one-year study completed a decade ago and found that the small mammal populations have apparently not been affected by the extensive mortality of mature Fraser firs and red spruce.

Based on our findings, these small mammals could provide an important prey base for a reintroduced fisher population. Rabbits and squirrels are abundant and will augment the small mammal prey base, as will birds and carrion. Mike Steele and Dr. Peter Weigl from Wake forest University have found that northern flying squirrels, although not common, are more numerous in the high elevation forest of the Southern Appalachians than formerly thought, including in Great Smoky Mountains National Park. Therefore, one might anticipate that the occasional northern flying squirrel a fisher finds on the ground and eats may have little to no impact on this endangered species. Dr. Weigl and the National Park Service have correctly noted, however, that we should be cautious in our assessment of how fishers might affect the northern flying squirrel populations, and that a final decision must await more data.

Finally, the forest measurements reveal that the northern hardwood and and spruce-fir forests of Great Smoky Mountains National Park are indeed very similar to forests in Upper Peninsula Michigan. The fisher's northern hardwood and conifer forests in Michigan are the only forests that have been measured and quantified as fisher habitat. Research done by Linda Thomasma of Michigan Technological University shows that fishers chose to hunt in areas of forest that are more like the forests that Paul and I measured in the Smokies than like the "average forest" in the Upper Peninsula. Since her research was conducted very close to where I had done mine, this strengthened my gut feeling that the forests in the Smokies should be good fisher habitat.

My final recommendation to the National Park Service is that reintroducing fishers to Great Smoky Mountains National Park is feasible. Whether that might occur—and how soon—depends on what is revealed from new data on northern flying squirrels, how the Park Service sets it priorities and on what reintroduction and management agreements would need to be developed between the Park Service and the N. C. Wildlife Resources Commission. These agreements would include when fishers can be trapped elsewhere to be reintroduced to the Smokies, and on other non-biological decisions that are critical for proper management of wildlife. But with a bit of luck, hikers in the Smokies might someday get an occasional glimpse of a low slung, darkly colored predator slipping into the shadows deep in the woods. That would be a fisher, and seeing one would be a thrill. ⛛

The Thousand POUNDERS

Not only does North Carolina produce more than its share of blue marlin, it has a reputation for producing really big ones that weigh half a ton.

by Joel Arrington © 1991

Time had almost run out on the last day of the tournament in August 1989 when the giant fish rose to a big squid off Cape Lookout. Will Grant was fishing aboard Capt. Howard Basnight's *Wave Runner*, and he remembers that it was a messy day.

"We had spotted a big water spout on the horizon," Grant later told columnist Duane Raver of *The Cary News*, "and we could see that it was churning up a chunk of ocean."

Basnight had been working over bottom that had paid off in the past, although few other boats in Ducks Unlimited's "Band the Billfish" tournament remained in the area. Basnight's instruments indicated his position to be about 45 miles off the cape as the *Wave Runner* worked a weedline north.

"I remember thinking, 'It's 2:45 and we've got only 15 minutes to hook up or else,'" Grant told Raver. "D.J. Patrick, the mate, had rigged a double hook in a squid about the size of my arm and now it skipped far back off a rod on the bridge. The Penn International reel was loaded with 100-pound test line with maybe a 400-pound test leader.

"It was my turn in the chair when the strike came," Grant said. "The fish took the squid with a sudden slam. D.J. was nearly speechless about the size of the fish that had just inhaled the bait.

"Even now, after this long to think about it," Grant said, "I'm not sure just what happened in the next few minutes. Howard gunned the boat, D.J. got me into the fighting chair and harness, and my companions quickly reeled in all the other lines. The fish was so big and confident that it just left with the bait as if to say, 'You guys haven't got a chance, so I'll just leave now.'

"And leave it did, with several hundred yards of line—nearly down to the spool. I couldn't slow it up at all. Howard quickly began backing down as fast as the rough sea would permit. The waves crashed over our heads as they slammed into the stern.

"My attention, however, was on the fish," Grant went on. "I hardly felt the bite of the harness on my back as I tried to do what the mate said. My buddies helped swing the swivel chair and they wiped the salt water from my face and arms.

"An hour went by, but time sort of stood still for me. I couldn't have told how long the fight had been going on. Another hour and the fish showed no signs of weakening.

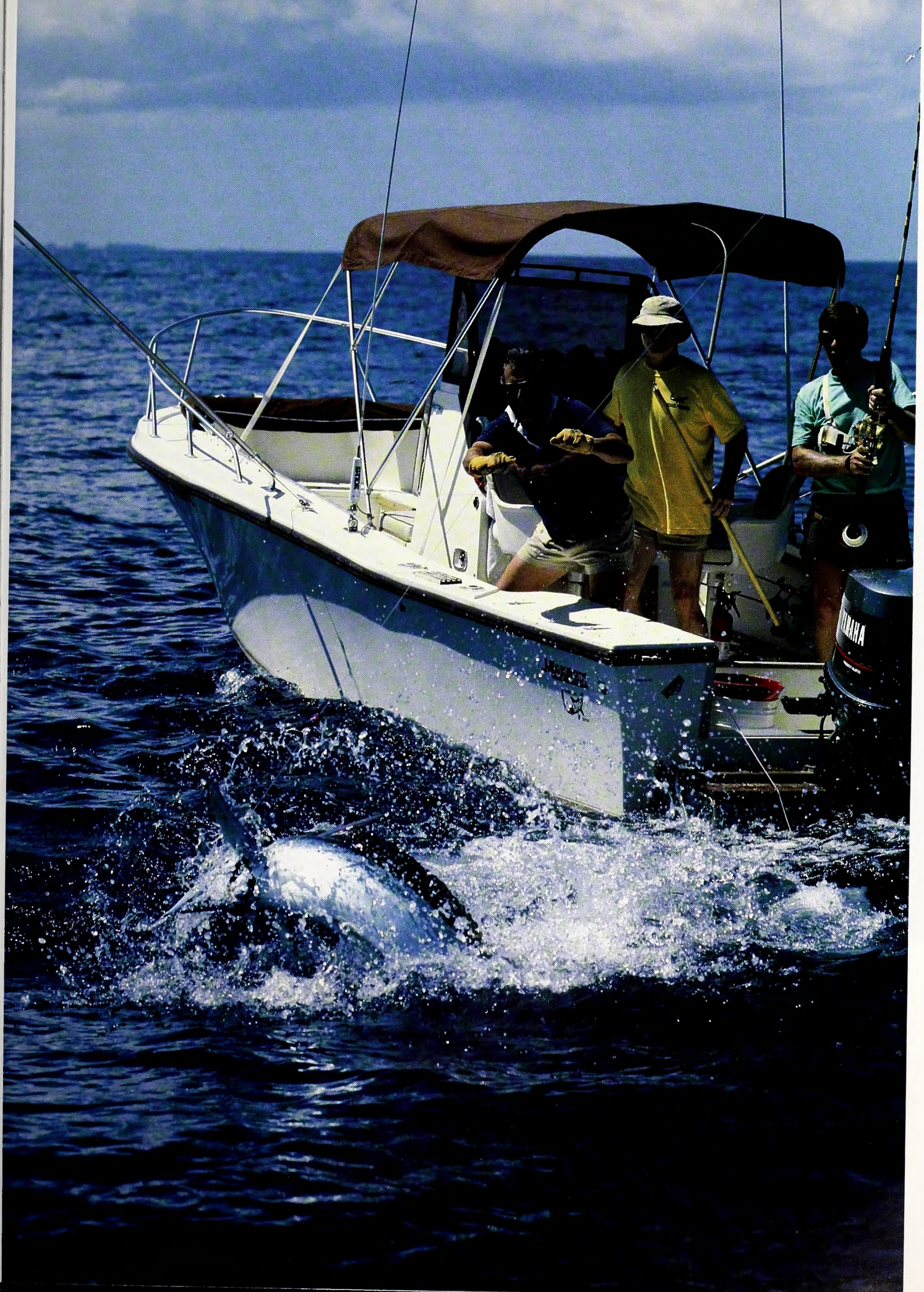
"We still hadn't seen it except for the instant of the strike," Grant said, "and one sort of head lunge. A marlin this size rarely jumps; it is simply too big to leave the water.

"Then my companions noticed my right thumb was bleeding where I had rubbed it raw gripping the reel handle. They put a glove on that hand, but I soon flung it off and went back reeling barehanded. Pain was the last thing I felt.

"Now it was decision time. Either we had to tag it and head for the dock to beat the 7:30 deadline (first prize was $11,000), try to boat the fish for mounting, or give up and cut it off.

"I decided to try to land it," Grant said. "It appeared to be close to a record and a marlin that size was probably in the last year or so of a long life-span anyway.

Anglers in this boat *battle a marlin off the coast of Florida. Off North Carolina, the Gulf Stream doesn't pass as close to our coast, so larger, more seaworthy boats are usually needed to pursue big billfish.*



JOEL ARRINGTON

***A knowledgeable captain** and crew—and a good fighting chair and proper tackle—are needed to effectively catch large marlin. Of about 21 thousand-pounders landed from the Atlantic, five have been taken off the North Carolina coast.*

"Three times the mate had the double line in his hand and the huge fish spotted the boat and took off. My companions thought maybe my end was nearer than that of the fish. During the final minutes of the titanic struggle they moved me out of the fighting chair and from exhaustion I sprawled on the pitching deck. They said I was white as a sheet.

"After three hours the marlin turned on its side and the battle was all but over. I pumped in the nearly lifeless fish and the end came at 6:20. Now how do we get the 15-foot giant aboard? We hauled it through the transom door. By now all hands were exhausted mentally and physically and that pull was like bringing in a dead ox. The tail, perhaps 4 feet wide, wouldn't fit through the door. More twisting and turning and finally the marlin lay there."

Grant said that the three-hour run to Atlantic Beach was graced with a rainbow over distant rain showers, then a spectacular blue and gold sunset. Patches of lightning gave way to moonlight turning the seas to silver.

Tournament rules requiring a 7:30 check-in, however, disqualified Grant's catch for the prize money, but not from everyone's honors list of angling achievement.

At 1,002 pounds, Grant's blue marlin is the most recent to exceed 1,000 pounds, but it still is not the largest caught in North Carolina. That honor goes to the first "grander" recorded from the Tar Heel state, Jack Herrington's 1,142-pound giant caught off Oregon Inlet in June 1974. Herrington held the International Game Fish Association's (IGFA) all-tackle record until 1977 when the largest Atlantic blue marlin caught so far on sporting tackle was boated off the Virgin Islands. That fish weighed 1,282 pounds. Of the approximately 21 granders so far recorded from the Atlantic Ocean, including the Gulf of Mexico, five were caught off North Carolina.

Experienced Tar Heel anglers and professional fishermen are not surprised. Many have their own tales of leviathans hooked and lost, some after all-night battles. Many live for the day they have an opportunity to lay their strength, skills and reputations on the line for a behemoth blue marlin. Virtually all have faith that the waters off North Carolina hold as much potential for big blues as any.

Maintaining separate record lists, the IGFA distinguishes between blue marlin from the Pacific and those from the Atlantic, although scientists classify both as the same species, *Makaira nigricans*. Pacific blues have run a little larger over the years, and a good many over 1,000 pounds have been recorded, but recent catches indicate that Atlantic blue marlin might attain a comparable maximum size. The biggest Pacific blue weighed 1,376 pounds, not much larger than the biggest Atlantic marlin.

Catches of all sizes of blue marlin off North Carolina have climbed since 1984. Few studies, however, consider effort. One would expect the catch to increase with effort, and anyone familiar with the offshore fishing scene will testify to increased boats, trips and tournaments.

The N.C. Saltwater Fishing Tournament (NCSWFT), a coast-wide contest, awards citations for released blue marlin of any size, and for captured fish weighing 300 pounds or more. It reports increasing annual citations for released blue marlin since 1984, slightly decreasing captures, and a record total of 377 citations in 1990. Releases as a percentage of the total catch have increased as more anglers and charter skippers have become sensitized to the urgency for conservation of billfish and other finfish stocks. Blue marlin released by anglers participating in the NCSWFT grew from 50 percent in 1974 to 93 percent in 1990.

Federal law since 1988 has made it illegal to sell billfish in the U.S.—except for Pacific billfish, for which there must be documentation—and in Puerto Rico, where there is an exemption for a small subsistence handline fishery. The Billfish Management Plan came to the rescue when stocks were on the ropes and just before a market for marlin and sailfish was about to become established.

Now one last hurdle remains for billfish: the tuna exclusion. The politically powerful tuna industry managed to get its product excluded from the congressional act that provides for fish management in federal waters. Uncounted thousands of billfish, mostly marlin, are caught on longlines set for tuna. This bycatch cannot be legally sold, indeed must be released "with as little harm as possible," according to the law. However, most billfish caught on longlines are dead when released, or are killed to reclaim a 75-cent hook. Indeed, longlines account for the only significant unnatural mortality in billfish. John Spence, Director of Development for the Billfish Foundation, a conservation organization based in Florida, said that researchers from the Louisiana State University Center for Wetlands Resources observed shooting and clubbing of blue marlin to recover hooks on over 20 trips with longliners out of Venice, Louisiana. Spence argues that a provision mandating onboard observers is much needed.

Anglers and managers remain hopeful that the Billfish Management Plan will prove

The Five Big Ones

DATE	WEIGHT	ANGLER	N.C. PORT	CAPTAIN
6/26/74	1,142 lb.	Jack Herrington	Oregon Inlet	Harry Baum
6/5/75	1,128 lb.	Fulton Katz	Hatteras	Ron Jones
8/22/87	1,020 lb.	Bob Senneville	Oregon Inlet	Sam Stokes
8/25/88	1,085 lb.	Michael Jefferies	Oregon Inlet	Brynner Parks
8/12/89	1,002 lb.	Will Grant	Morehead City	Howard Basnight

effective, but most agree that until tunas are brought under management authority, billfish stocks will remain in jeopardy. A step in that direction occurred earlier this year when an amendment to the Magnuson Act placed tunas under a redefined grouping of species that are considered to be highly migratory. The Secretary of Commerce was given authority over tunas on the U.S. East Coast, while the councils retain responsibility on the West Coast. Legal authorities say ambiguities in the law linger, and managers say the result in tuna management remains to be seen.

In the meantime, anyone who wants to catch and release a blue marlin can do worse than the waters off North Carolina. Commercial hook-and-line tuna fishermen catch a few accidentally in winter. Migrations, however, bring the main runs beginning in May and ending in October, and most fish entered in the NCSWFT are caught in the summer months. Larger females reportedly arrive early off North Carolina, smaller males later. Two of the five N.C. granders were caught in June, three were boated in August. Notwithstanding the spring run of females, some say the period around the full moon in August remains the best for large fish based on counts of both captured and many escaped giants.

Charters may be booked at all North Carolina's major ports, but those in the northern sector have shorter runs to the offshore fishing grounds. Blue marlin prowl the Gulf Stream in depths of over 100 fathoms along the edge of the continental shelf. Customers should shop for boats whose skipper and crew enjoy a good reputation for success on billfish. Oddly, some of the boats themselves seem to attract billfish better than others. No one knows exactly why, but a change in propellers has been known to alter success rates dramatically.

You also want a competent and pleasant mate, first-class heavy tackle and a good fighting chair with a foot rest. With a big reel and 100-pound test line, the angler cannot possibly hold a 25- to 50-pound full drag with only his arms. For big blues, anglers require a harness and a good chair, so that they can get their backs and legs into the fight.

Anglers serious about blue marlin may want to narrow the focus to only big blues, and not be concerned about the smaller white marlin, sailfish, wahoo, dolphin and tuna that can attack the baits. Even an average blue is formidable. Off North Carolina, the average blue marlin weighs something over 300 pounds early in the season when the females predominate, something under 300 pounds later when the run is made up mostly of the smaller males.

When fishing only for big blues, the angler might insist that no more than three or four lines be trolled at the same time so that the cockpit can be cleared quickly when a fish strikes, and the boat backed down rapidly before the marlin gets too much line off the reel. It's not unusual for a big fish to run out several hundred yards of line and sound (dive), where it can die and cannot be pumped up.

What are your chances, then, of catching a blue marlin off North Carolina? I doubt the odds can be usefully calculated because there are so many variables, but a rough guess may give an idea. Boats with good crews that especially target blue marlin have success rates much higher than the average charter boat out to catch whatever it might happen upon. Realistically, odds of even seeing a blue, much less of hooking and releasing one, remain long. A reasonable surmise might be a legitimate blue marlin release for every 10 to 20 trips if you took the trips between June and August off the Outer Banks. You might do a bit better if you tried to target only blue marlin. Offshore charters cost less in North Carolina than at most other U.S. ports and fishing is not nearly as good at these other ports. Still at over $750 plus tips, blue marlin fishing remains expensive.

Yet anglers get lucky. A few who have shared expenses with friends happened to be up for the chair when the big one came into the baits. It's a lot like winning the sweepstakes. Ask Will Grant. ⊠

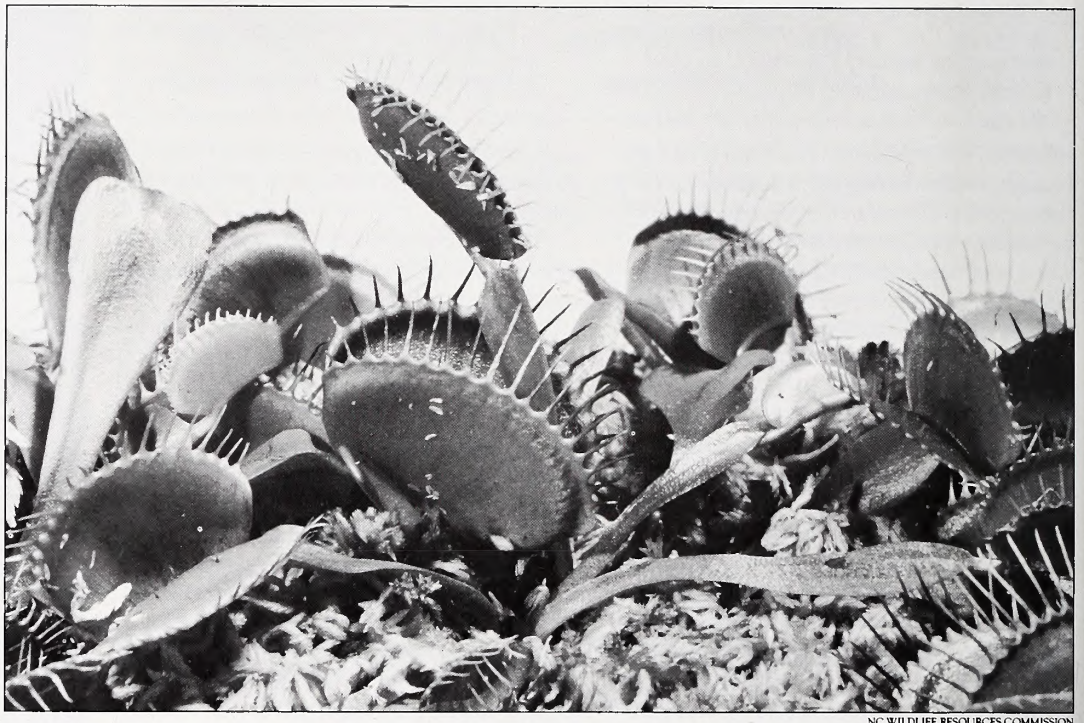
JOEL ARRINGTON

***Weigh-in scenes** like this are growing less common as billfish anglers realize the importance of tagging and releasing marlin to live to fight another day. Unfortunately, commercial tuna fishermen working the Atlantic still take a heavy toll of billfish stocks.*

Stiffer Penalties May Deter Poaching

Law Strengthened To Protect Rare Venus's-Flytraps

Written and Edited by Vic Venters



NC WILDLIFE RESOURCES COMMISSION

Vanishing Venus's-Flytraps: *A combination of habitat destruction and intense poaching is threatening the rare, insect-eating Venus's-flytrap. A new set of laws, however, allows for stiffer penalties against poachers and may serve as a deterrent.*

Although few small insects are safe around its carnivorous leaves, the Venus's-flytrap has not been able to protect itself from the hands of poachers. Fortunately, the flytrap has gotten some badly needed protection thanks to a new set of laws designed to curb intense poaching pressure on this rare insect-eating plant.

The Venus's-flytrap was originally found within a 100-mile radius of Wilmington in at least 18 counties in North Carolina and three counties in South Carolina. Habitat destruction has whittled that range down to about half its original size, and now heavy poaching pressure on remaining concentrations is seriously impacting flytrap populations. The plants are prized by collectors as houseplants because of their interesting bug-eating capabilities. Poachers can sell the plants for as much as $1.50 to $3 each. Some experts have estimated that as many as 500,000 Venus's-flytraps are removed from the wild each year.

The old flytrap poaching law carried a penalty of only $10 for illegal collection. The new laws have considerably more bite, with a minimum $100 fine and a maximum $500 for convicted first offenders. Repeat offenders can be fined as much as $1,000. "Technically, each plant that has been poached can count as a separate charge," said Cecil Frost, head of the Plant Conservation Program. "Potentially, offenders are looking at some very steep fines."

The new law took effect June 1. At the request of the N.C. Wildlife Resources Commission, the state's Department of Agriculture's Plant Conservation Program named the Venus's-flytrap a "species of special concern," thus affording the plant better protection through tough penalties. The Plant Conservation Board approved exceptions that allow people to collect flytraps on public lands with a permit and on private lands with the written permission of the landowner. People who own land with flytraps may also still legally collect the plants.

The last several decades have not been good for the flytraps. They are now found in only about 50 sites in 11 North Carolina counties and a few scattered sites in South Carolina. "The destruction or alteration of their wetland habitat is responsible for most of the declines," explained Frost. "Venus's-flytraps need high water tables and areas where frequent fires keep the understory down. There used to be large areas of private land in the southeastern Coastal Plain where they lived. Most of these areas have either been drained or ditched and put into pine plantations."

The remaining large concentrations of flytraps have been reduced to ranges on protected lands such as the Nature Conservancy's 15,700-acre Green Swamp tract in Brunswick County and the Holly Shelter Game Land tract managed by the Wildlife Commission. As the flytrap has disappeared from private lands, poaching pressure has greatly increased on the remaining populations. This spring, for example, Wildlife Commission enforcement officers caught three men in the Green Swamp with more than 1,000 flytraps in their possession.

Demand for flytraps continues to be strong, especially overseas in Germany, Japan and Holland. Venus's-flytraps can be propagated from domestic sources but it takes about twice as long to get a mature plant as it does when propagating from wild sources. Poached plants offer illegal dealers a cheap, easily obtained supply. "Hopefully, this new law might make a difference," Frost said. "When people could make some money off the sale of the plants, the old $10 fine wasn't much of a deterrent. Today, if you get caught poaching, it's not a cheap proposition. If convicted, you're going to lose a lot of money."

Study Planned at Cedar Island

Project Will Study Affects of Military Jet Noise on Waterfowl

How well do black ducks and jet bombers go together? Wildlife researchers hope to answer this question through a study conducted by state, federal and Marine Corps officials that will determine if military plane noise is adversely affecting waterfowl in eastern North Carolina.

Researchers from the N.C. Wildlife Resources Commission, the U.S. Fish and Wildlife Service and N.C. State University will monitor wild free-ranging and captive black ducks. The study is being conducted at the request of the U.S. Marine Corps at their Cherry Point base. About 70 ducks, now breeding at an NCSU research facility in Raleigh, will be taken in August to Piney Island near the Cedar Island National Wildlife Refuge in Carteret County, where military flights are frequent. Marine Corps planes fly at speeds of 500 miles per hour at levels 150 feet above the marshes that serve as key wintering areas for black ducks and other waterfowl species.

"We want to know whether the ducks are affected by the high noise levels in the plane's flight area," said Dr. Jim Fleming, leader of the cooperative Fish and Wildlife Unit housed at N.C. State University. The unit was set up in 1962 by the Wildlife Commission, the U.S. Fish and Wildlife Service and NCSU to study fisheries problems in North Carolina. In 1989, the unit expanded to address wildlife issues.

During the five-year study, researchers will watch for changes in the captive duck's body weights, molting sequences, behavior patterns and breeding success. Researchers will also study whether free-ranging ducks avoid the high-noise area, and whether some species can adjust to noise levels while others cannot.

Black ducks have traditionally been an important waterfowl species to North Carolina and other Atlantic Flyway states. Their populations have declined severely in recent years. Black ducks breed from North Carolina up the Atlantic Coast, with principal breeding grounds located in Canada.

The 70 ducks used in the flight-noise study were brought to the NCSU campus last August from the Patuxent Wildlife Research Center in Maryland. The ducks were paired in pens and are currently breeding. "We expect clutches of about nine to 12 eggs per nest," said Ed Temple, an NCSU graduate student who is working on the project to earn a masters degree in biology. "We will have up to 200 ducklings when they all hatch."

The adult pairs and some ducklings will be taken to Piney Island and placed in pens for the noise study. "If there are trends suggesting that the noise has an impact on waterfowl, we hope we'll be able to identify the problem with our captive ducks," Dr. Fleming said. "This is the first comprehensive study nationwide of waterfowl responses to airplane noise. The results could have implications for coastal areas from Florida to Maine."

The Cooperative Research Unit will issue a report when the project is complete.

— Angela Dorman Hill

ANGELA DORMAN HILL

Bombers and Black Ducks: *N.C. State University graduate student Ed Temple holds one of the black ducks that will help biologists determine whether military plane noise is affecting waterfowl in coastal North Carolina counties.*

New Sportsman's Print Available

North Carolina's 1991 sportsman's stamp print features a pair of raccoons.

This print will accompany last year's sportsman's license stamp. Wildlife artist Robert Leslie of New Jersey painted the raccoons for the sportsman's license stamp and print program. Leslie is a nationally renowned wildlife artist and was also the artist for the 1990 North Carolina waterfowl stamp and print. (See inside back page for color reproduction of print and stamp.)

Buyers of the state's annual sportsman's license receive the sportsman's stamp each year. The prints and stamps are available from art dealers through December 31, 1991. After that time, remaining sportsman stamps and prints will be destroyed. A Wildlife Commission policy requires that all unsold art prints and stamps be destroyed six months after the stamps expire as legal licenses. This helps increase the value of both the prints and stamps.

— Angela Dorman Hill

Insurance Company Donates Land

Swan Quarter Wildlife Refuge Expanded

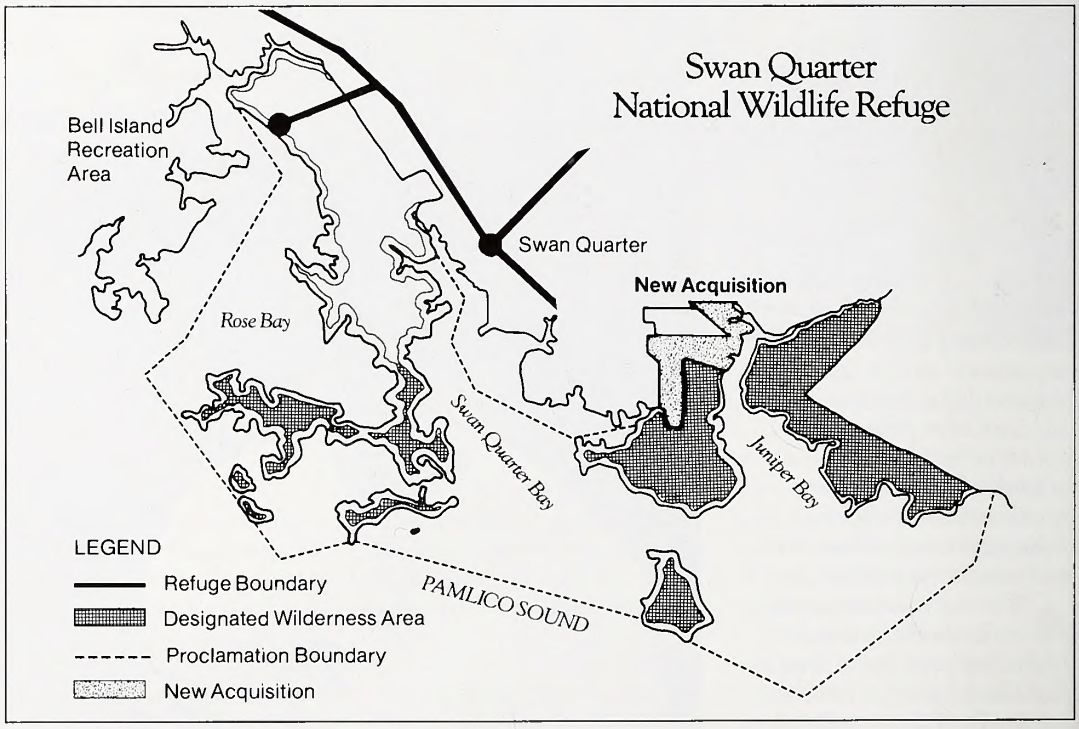
Ducks and other wintering waterfowl will be assured of a little more good habitat in years to come thanks to Transamerica Insurance Company. The insurance company has donated 768 acres of wildlife habitat in Hyde County to the Nature Conservancy's North Carolina chapter.

The Conservancy plans to transfer the property to the U.S. Department of the Interior for inclusion in the Swan Quarter National Wildlife Refuge later this year. The Transamerica tract will connect two separate parts of the refuge. Transamerica acquired the property as part of a settlement of a fidelity bond claim. The idea to donate the land to the Nature Conservancy came from Frederica Preacher, a bond claims adjustor in the company's Atlanta bond claims office.

Established in 1932, Swan Quarter National Wildlife Refuge comprises 15,500 acres of brackish marsh and woodlands located along Pamlico Sound in Hyde County. Natural forces such as hurricanes, lightning fires and saltwater intrusions have shaped and maintained this wetland wilderness. "I think Transamerica should be commended for doing its part for conservation," said Frederick Annand, associate director for the N.C. Nature Conservancy. "This donation adds valuable wetlands to the public trust."

At least three federally listed endangered species are known to inhabit the Swan Quarter refuge—bald eagles, peregrine falcons and American alligators that exist here at the northernmost edge of their range. The refuge is also an important wintering sanctuary for canvasback, scaup and ring-necked ducks, as well as swans, Canada geese, mallards and black ducks.

The Nature Conservancy is an international, non-profit membership organization committed to the preservation of plants, animals and natural communities. Since its inception in 1977, the Nature Conservancy's North Carolina chapter has protected over 332,000 acres in North Carolina with funds obtained from gifts, grants and donations from individuals and corporations. For further information, contact the North Carolina Nature Conservancy, Carr Mill, Suite 223, Carrboro, NC 27510, or call (919) 967-7007.



Proceeds Benefit Conservation Groups

Wildlife Sportsman's Show Set for New Bern

The fourth annual North Carolina Wildlife and Sportsman's Show will be held in New Bern the weekend of September 6-8. A Friday evening auction will serve as the preliminary event.

The show has proved extremely popular in past years, in part because the event organizers have been able to attract big-name artists, knifemakers, dog trainers, and other sporting and wildlife experts. This year, look for more of the same. Renowned dog trainer Richard Wolters and his Grand Master Retriever, a Labrador named Tar, will be present.

Artist Ralph McDonald of Gallatin, Tennessee, painted this year's official poster. McDonald was the trophy winner in the painting category for the 1990 show. Other 1990 trophy winners, Daniel Winkler of Boone and John Busfield of Roanoke Rapids, are crafting custom knives for the opening night auction and will be featured knifemakers. Trophy winner Jerry Barkely of New Bern will be the featured carver.

The show is being sponsored by the New Bern Area Chamber of Commerce and will benefit a number of conservation groups including Ducks Unlimited, Quail Unlimited, Wild Turkey Federation and the Carolina Raptor Center and other conservation groups.

For more information, write the New Bern Chamber of Commerce, P.O. Drawer C, NC 28563, or call (919) 637-3111.

Tails Wag, Heads Move

Robot Deer Decoys Feature Life-like Moves

Last year, the Wildlife Resources Commission's use of foam deer decoys to fool night-lighting poachers proved successful. Hundreds of arrests were made when unwitting poachers pulled the trigger on the urethane decoy only to find themselves bagged by a waiting enforcement officer.

Somewhere out there, no doubt, there are still poachers who claim they can distinguish real deer from fake foam decoys and boast they will continue their illegal activities with impunity. It's doubtful, however, that they will have much success in Sgt. Tony Robinson's neck of the woods. With the financial help of the local court system, Sgt. Robinson in District 8 has built a motorized, mechanical robot deer decoy that features a head that can be made to move by a radio-controlled unit. The robot deer is built on a taxidermy mount and is covered by actual deer hide for an ultra-realistic appearance. "I can control its head movement with my radio-controlled unit from a half a mile away," said Robinson, an electronics buff.

"The regular foam decoys catch a lot of poachers, but they don't fool all of them," he added. "With the real deer hide and head movement, the robot deer is much more realistic."

He's also in the process of building several more robot deer with even more life-like features. "My completed decoy is relatively simple compared to some I'm working on right now," Robinson explained. "I've got one that is going to appear to walk, and another that will allow the head to move up and down to simulate feeding. It can also turn its upper neck and head to peer back over its shoulder. I'm designing them so their tails will wag, too.

"The key is creating an illusion so that the poacher thinks he is seeing a real deer with a wagging tail or feeding behavior," Robinson said.

Robinson's decoys are designed to be resistant to buckshot and small arms fire. They are also designed to be relatively easy to repair if hit in a motor part by a high-powered deer cartridge. "I've put a lot of thought into this when designing it," Robinson said. "Most of the expensive parts are out of the decoys, minimizing any chance of expensive damage." Although each of the deer decoys will be different, all their parts will be interchangeable.

Funds to pay for the decoys have been awarded to the Wildlife Resources Commission by courts in District 8, which is located in the western part of the state.

Robinson has also produced a 30-minute how-to video that offers instructional tips on building the decoy. "My goal is to build decoys for use in all the areas in my district," Robinson said. "I'd also like to see a lot of officers around the state using similar decoys."

"If we can get these things out there in any numbers, one day it will reach a point where the poachers don't know if it's a real deer in their sights or not," Robinson elaborated. "That's the illusion I want to create. If that deterrent keeps them from pulling the trigger then we'll save a lot of deer."

Volunteer Instructors To Get Awards

Commission Awards Hunting Safety Instructors

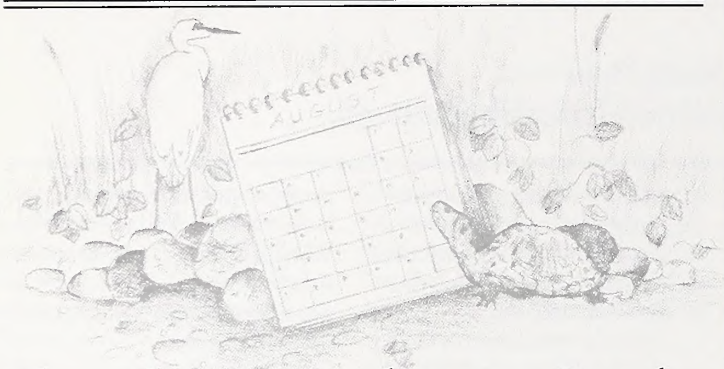
Dove season is only a month away, and if you're planning on waiting until the last minute to buy a hunting license, you'd better be sure that you've passed North Carolina's certified hunting-safety course or can show proof of having a prior hunting license. If you're a first time buyer, you must pass the certified hunting-safety course. This new law is an addition to the state's hunting-safety requirements.

Volunteer instructors are still needed to teach the hunting-safety courses. Volunteer instructors will need to complete an instructor's course before they are certified to teach the hunter-safety classes. In order to take the instructor's course, volunteers should be 21 years old and have graduated from the hunter-safety course. The course requires at least 10 hours of instruction.

To demonstrate the Wildlife Commission's appreciation for volunteer services, the Division of Enforcement is expanding its award program. Prizes such as windshield sunscreens, caps, coffee cups, beverage coasters, shirts and jackets will be awarded to volunteer instructors according to the number of students they have certified in the hunter-education program. All prizes will be inscribed with the hunter-safety and education message. If you would like to volunteer to be an instructor or obtain more information on hunter-safety courses, call the Commission's Division of Enforcement at (919) 733-7191.

MELISSA McGAW

Instructor's Gifts: *As a measure of appreciation, the Wildlife Commission is offering these items to reward volunteer hunting safety course instructors for their help. Volunteers are still needed to teach classes.*



Planting Rye, Reclaiming Ponds, Counting Rabbits

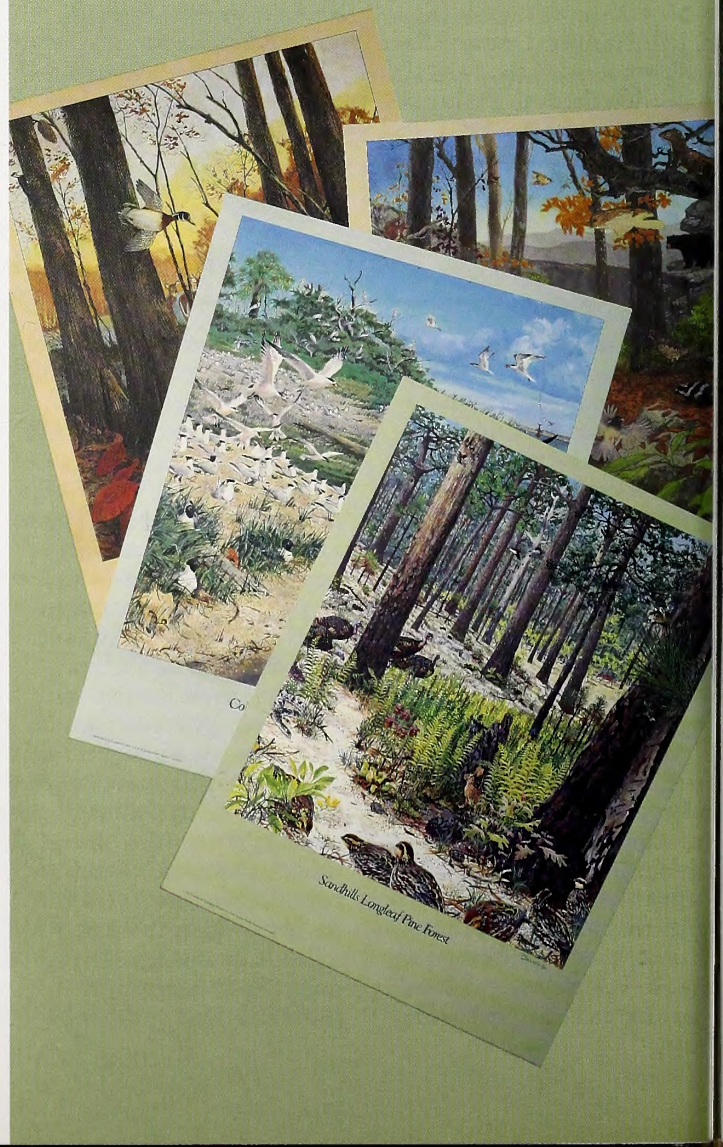
by Vic Venters

In August, no one thinks about winter very much. Yet, habitat work performed this month will help many wildlife species prosper and survive in the coming cold months.

Rye: If you want to provide your deer herd with a source of highly nutritious green winter forage, consider planting rye this month. August 20 to 31 is the optimum time to seed rye in the Piedmont and in western North Carolina, while the first two weeks in September provide the best seeding time for rye in the Coastal Plain. Although most rye grown for agricultural purposes is planted with a seed drill, there's no need to go to such trouble for smaller rye food plots. Simply broadcast the seed by hand, or with a small, hand-cranked rotary seed spreader.

Rabbit Counts: Late summer is a good time to evaluate your land's rabbit population. Counts should be conducted during early morning or late afternoon, when the rabbits are most active (and when it's cooler, too). Look for rabbits along roads, field edges, and in pastures near hedgerows. If you see rabbits in a variety of sizes, that means you've had successful breeding throughout the summer period. Rabbits that are all one size probably indicate that breeding was successful during only one period. If you see few rabbits where you previously had many, you may need to do some habitat work to provide breeding cover and protection from predators. Contact the Wildlife Commission's Division of Wildlife Management at (919) 733-7291 for more information.

Rotenone Ponds: When stunted fish or undesirable species dominate the population of a pond, you may want to consider reclaiming it by applying rotenone (a fish toxin) to kill the unwanted fish. This month or September is the best time to reclaim a pond because the warm temperatures will speed the chemical breakdown of rotenone and hasten its detoxification. This will also allow the pond to refill so that it can be stocked during the fall. You should first reduce the water level to as low as possible in the pond. Less rotenone will be needed and the fish will be concentrated in a smaller area. Contact a Wildlife Resources Commission biologist to obtain rotenone. A Wildlife Commission employee must be present when the poison is applied. Most fish will die within one day of application. Do not eat poisoned fish. Cattle or livestock should not be allowed to drink from the pond for 10 days. In warm water, the rotenone should become non-toxic within four to 10 days. Fish may be stocked two weeks after application. For more information, contact the Wildlife Commission's Division of Inland Fisheries at (919) 733-3633.

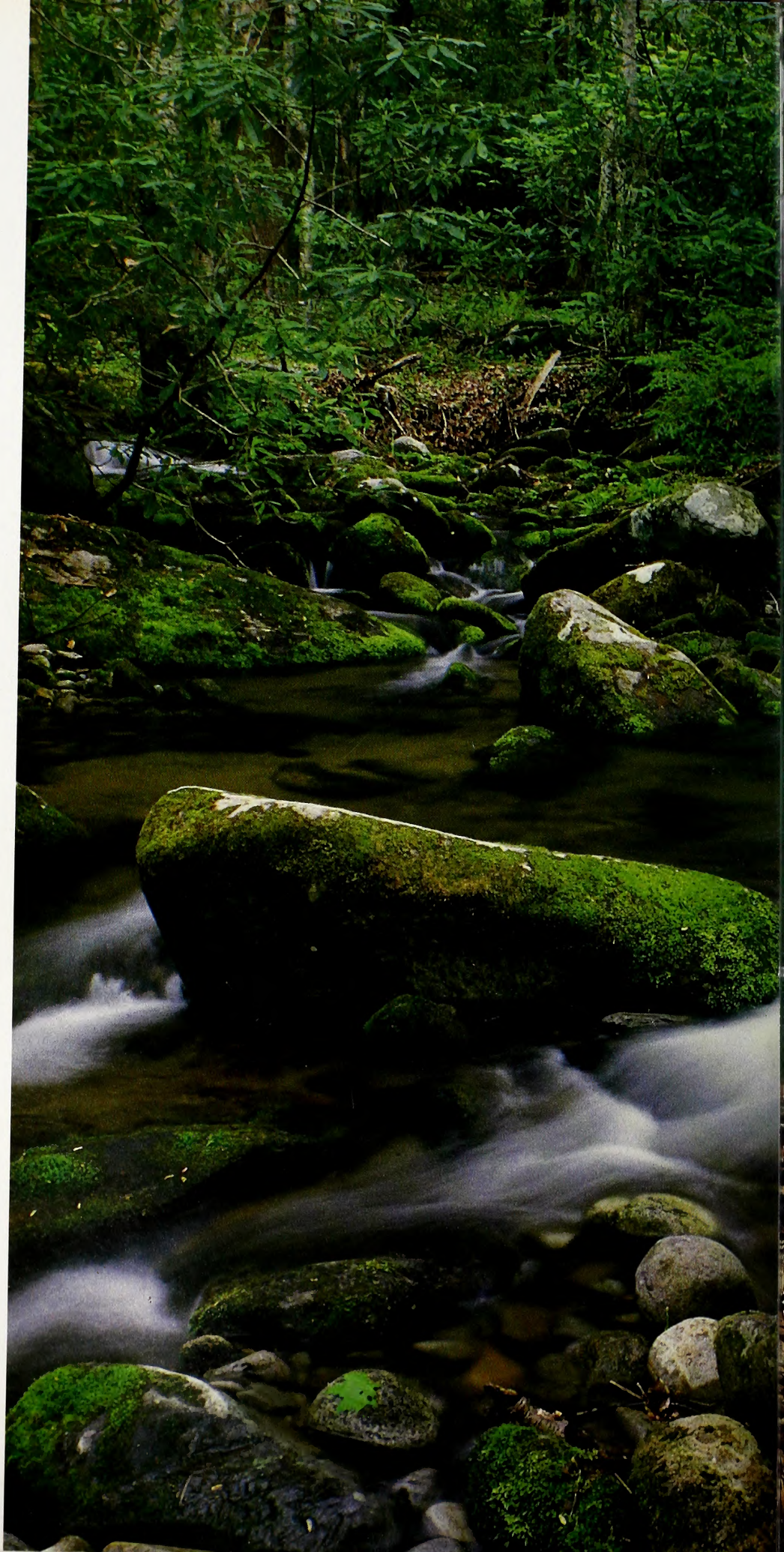


This Limited Edition Print of the 1990-91 Sportsman's Stamp License is Now Available.

Robert Leslie

Robert Leslie painted this pair of raccoons for the 1991 North Carolina Sportsman's Stamp Print.

To order your 1991 North Carolina Sportsman's Stamp or print, contact your local license agent or picture framer/art dealer. Your purchase of a sportsman's stamp or print will support North Carolina's wildlife conservation programs.



Trout Heaven

Deep in the Smokies, this pretty stream hosts plenty of wary brook trout.

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WILDLIFE IN NORTH CAROLINA

SEPTEMBER 1991 $1.50

One Berry Picker Moves On

by Jim Dean

The berry picker is gone. No one has seen him since last winter, and the official story is that he packed up and left when the weather turned cold. Not that he will be missed.

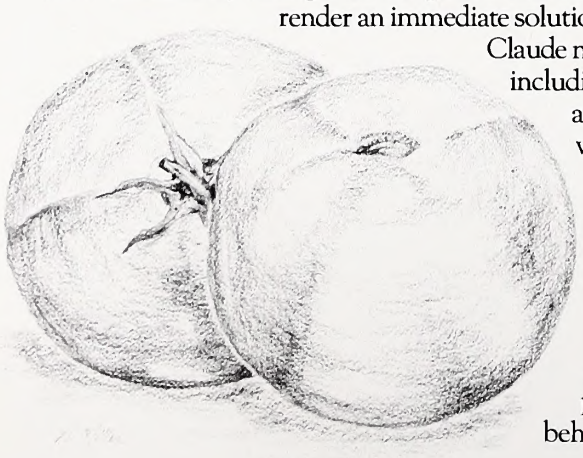
The berry picker showed up two years ago in this small, isolated mountain settlement and quickly earned his nickname. Almost every day, he walked the dirt road carrying a sack. Occasionally, he could be seen cutting through back yards, and he seemed to pick times when his neighbors were away or indoors. He never came to the store, and seldom spoke to anyone even when greeted. People thought that was strange, even for a Yankee.

First, the cherries disappeared from a tree alongside the road. Then, the tomatoes never seemed to get quite ripe, and sweet corn became a rare commodity. Stacks of firewood dwindled just a bit faster than you'd reckon they should. Full kerosene drums echoed when you thumped them. After a new charcoal grill and a lawn mower evaporated, people moved their porch furniture indoors.

Everyone knew who it was, of course. As any newcomer here would, he'd been a natural object of suspicion even before the first tomato disappeared. He only thought he wasn't being watched. Besides, it wasn't exactly circumstantial evidence when he'd leave his cabin with an empty poke and complete his rounds with a full one.

From my viewpoint, the situation began to get serious when Joe reported that he'd confronted the berry picker sneaking through the rhododendron down on the creek early one morning with a string of trout. "I mentioned our little community agreement concerning trout and what we kept and what we didn't," said Joe, who at an amiable 6'5" is generally listened to when he mentions anything. "You never heard such cussing in your life. Said them trout were put there for him by The Almighty."

That explained why private vegetables and personal firewood were consistently falling into the public domain, but it didn't render an immediate solution. Neither Joe, Claude nor anyone else, including me, felt that a few trout were worth it. Meanwhile, if The Almighty wasn't getting weary of His needful charge, those who were planting on His behalf surely were.



The truth is that the berry picker was pushing his luck more than he knew in this nineteenth-century village where one of his neighbors (nobody I'll mention) was reputedly a reformed bootlegger, and another was reputedly not (reformed, that is). Also not taken into account was the rumor that another neighbor long-gentled by these harsh hills and true friends had once served time for multiple manslaughter. Nor, obviously, had the berry picker tried to remove any of His trout from the private tributary across the ridge where the caretaker regularly overlooked the domain with a Budweiser in one hand and a .45 in the other.

And so the growing season passed in fretful tranquility. The summer people came and went, but the right opportunity and the means to seize it remained elusive. Everyone agreed that we needed a man like Johnson. It was the near-legendary Johnson who years earlier had put the fear of God in the frogman, a tourist who had kept everyone awake at night for weeks shooting bullfrogs in puddles along the creek until he made the mistake of jumping a frog on Johnson's claim. It was also Johnson who had once run into a couple of trout poachers up in the refuge and informed them they were breaking the law. They were not at first impressed.

"I saw your Jeep parked a 40-minute walk straight up the ridge," Johnson told them, "and my Bronco is parked five minutes down the creek. I don't think there's any way in the world you can beat me to your Jeep, but you dang well better try."

"That's the meanest man we ever met," the exhausted poachers told everyone at the store when they finally rolled in on the rims and stopped to try to buy four inner tubes. "If we get out from in here, you tell him we ain't coming back." But Johnson no longer visited regularly, and the berry picking situation was at an impasse when I closed up the cabin late last fall. On my first trip back this spring, I noticed that the furniture was back on the porches.

"What happened to the berry picker?" I asked at the store."He didn't chance upon any mash barrels or walk into a bullet, did he?"

"Why, he just upped and left," said Joe with a knowing smile on his face.

"Well, I'm glad to hear that," I said. "Maybe I'll be able to catch a trout and eat a tomato this year."

"I wouldn't count on that too heavily," sighed Claude. "There will always be a berry picker, you know, just not that particular one."

I was nearly out the door, when a thought occurred. "Johnson didn't by chance get up here this past winter, did he?"

"Once briefly. He asked how come his kerosene drum was empty. Could be somebody told him The Almighty was cold."

September, 1991
Volume 55, Number 9

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WILDLIFE IN NORTH CAROLINA

Wildlife in North Carolina is the official educational publication of the North Carolina Wildlife Resources Commission, and is dedicated to the sound conservation of the State's wildlife and other interrelated natural resources and the environment we share with them.

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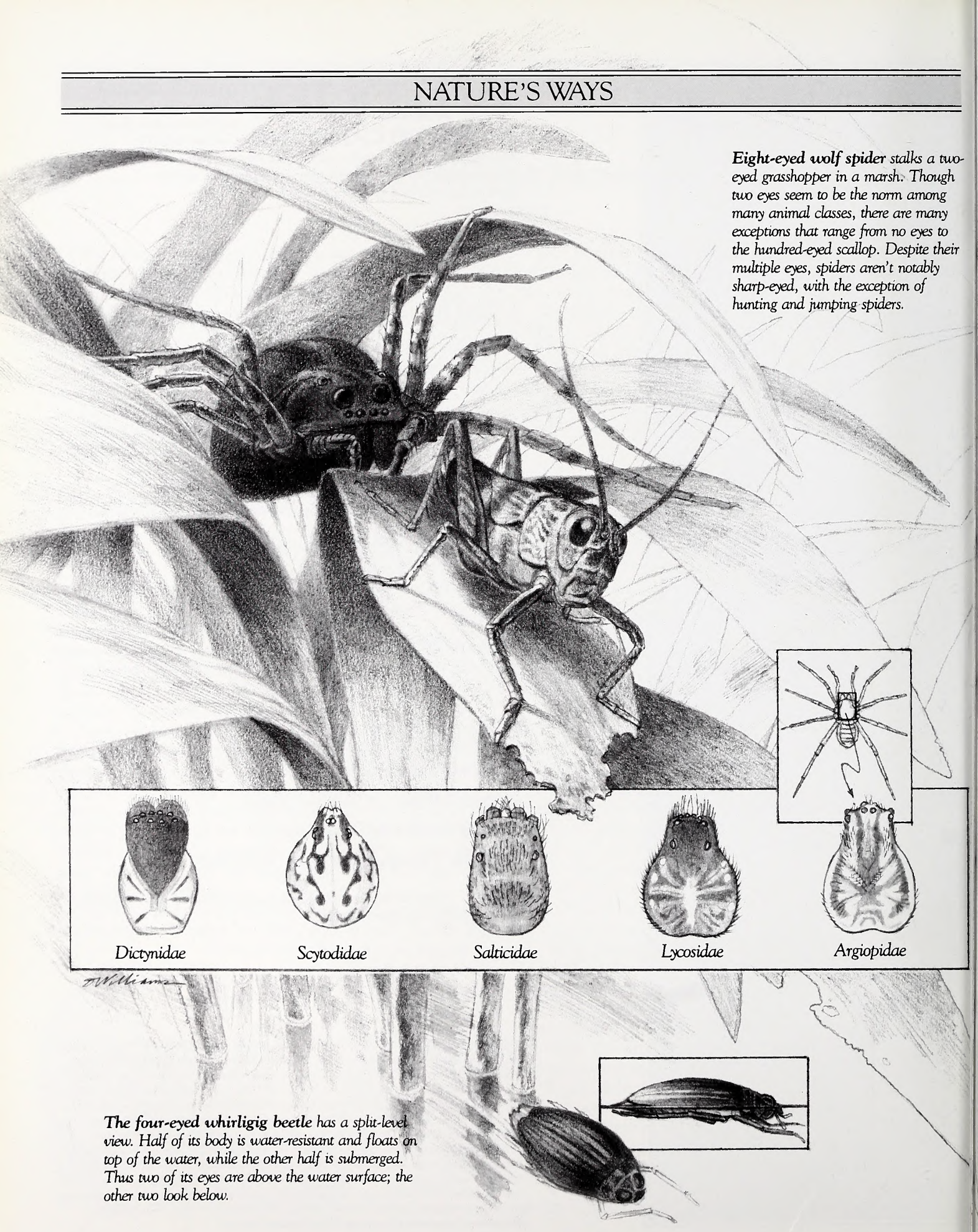
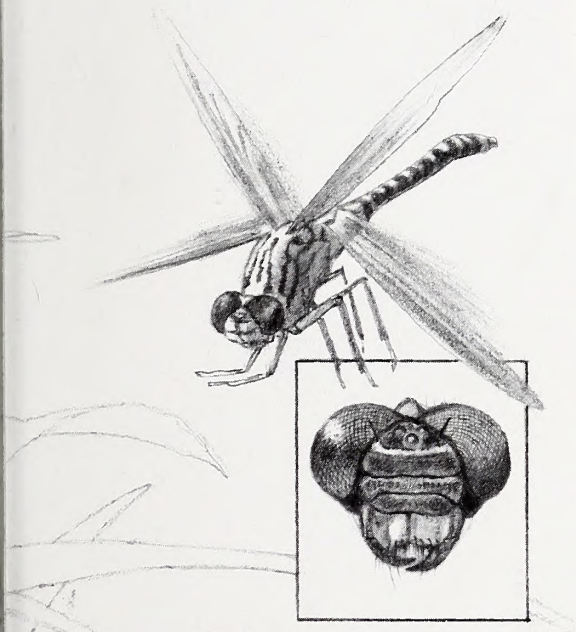


Eight-eyed wolf spider *stalks a two-eyed grasshopper in a marsh. Though two eyes seem to be the norm among many animal classes, there are many exceptions that range from no eyes to the hundred-eyed scallop. Despite their multiple eyes, spiders aren't notably sharp-eyed, with the exception of hunting and jumping spiders.*

The four-eyed whirligig beetle *has a split-level view. Half of its body is water-resistant and floats on top of the water, while the other half is submerged. Thus two of its eyes are above the water surface; the other two look below.*

The Eyes Have It

written by Lawrence S. Earley/illustrated by David Williams



***The bulging compound eyes** of this dragonfly contain 28,000 facets in each eye. Each facet contains its own visual apparatus, with a lens and retina. Though no one knows exactly what an insect sees through its compound eyes, the dragonfly's aerial hunting skills prove that it has superior vision.*

***Though most spiders** have eight eyes, their arrangement on the head differs from family to family. Viewed from above, eye placement reveals an astonishing variety. From left to right, a mesh-webbed spider (family* Dictynidae*), daddy long leg spider (family* Scytodidae*), jumping spider (family* Salticidae*), wolf spider (family* Lycosidae*) and orb web spider (family* Argiopidae*).*

How many eyes do you really need? Two, you say hesitantly, not knowing what I have up my sleeve, but you're right—for the most part. Two eyes do seem to be the norm, especially among fish, birds and mammals. For these animals, two eyes provide the binocular vision that makes objects in space three dimensional, a visual advantage when you want to catch something or when the neighborhood predator is prowling about.

But right away you run into exceptions—one-eyed creatures and even species with no eyes, usually those that spend their lives entirely in the dark. And for other species, two eyes are just the beginning, just the tip of the ocular iceberg.

For example, some fish, amphibians and reptiles have a third eye. It's a somewhat mysterious organ that's most developed among some lizards and is found between the two normally placed eyes. Called the parapineal organ, this structure looks like an eye—it has a retina, a lens and a cornea—and it seems to function like one because it's sensitive to light and even color. Though not a lot is known about it, scientists think that the third eye may perceive the presence or absence of light, information which may help the animal time its daily rhythms.

Then there are the four-eyed animals, prominent among them the *Anableps*, a "four-eyed" fish, and a couple of four-eyed insects, the milkweed beetle and the whirligig beetle. It's not clear what advantage the milkweed beetle gets from its extra pair of eyes, but the additions serve the whirligig beetle well. This whirligig turns giddily about like a carnival car with its upper body above the surface film of water and its lower body submerged. Four eyes are invaluable for the beetle's split existence, for two eyes are positioned so they are looking up, and the other two look down into the depths below.

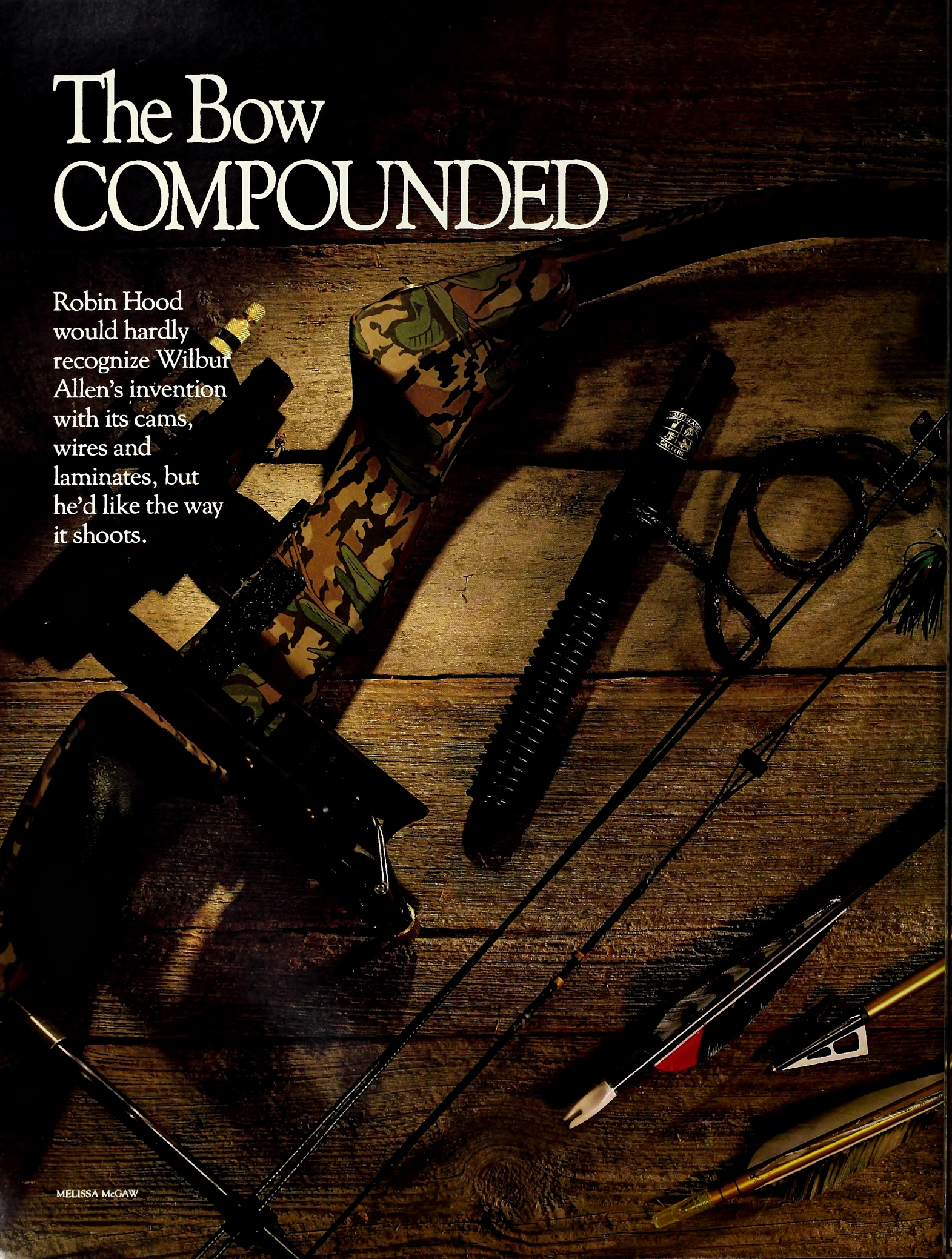
Insects and especially spiders seem to have specialized in multiple eyes. Insects normally have two sets of eyes—a set of two large, compound eyes and, between them, a set of three so-called "simple" eyes called *ocelli* whose function is not well understood. Each compound eye consists of many individual facets or eyes, each containing its own fixed-focus lens and retina. Evidently the more lenses in the compound eye, the better the vision. Thus ants, with only 10 facets in their eyes, get around mostly using their sense of touch; dragonflies, with an extraordinary 28,000 facets in each compound eye, hunt on the wing with great skill and accuracy.

Spiders take the concept of multiple eyes a little further. They generally have about as many eyes as legs—eight—but there are one-eyed, two-eyed, four-eyed, six-eyed and even 12-eyed models. These additional eyes don't necessarily mean better vision. Lacking the lenses of the insects' compound eyes and their image-forming power, spiders' eyes function more like the simple eyes of insects. As a result, spiders are short-sighted, notable exceptions being the jumping and hunting spiders, especially the wolf spider, whose eyes are large and whose vision is acute.

Possibly the record for multiple eyes is held by the scallop which comes equipped with nearly 100 sky-blue eyes. Why so many? Knowing how animals vary in eye number, you might as easily ask, why so few?

The Bow COMPOUNDED

Robin Hood would hardly recognize Wilbur Allen's invention with its cams, wires and laminates, but he'd like the way it shoots.



MELISSA McGAW

by Joel Vance ©1991

If Robin Hood were plunked down in the middle of a North Carolina archery hunt, his jaw would drop so far in amazement, he'd have to kick it out of the way, like a point-after try in football.

Because Robin would see a bow unlike anything that existed in his time, even in the most fevered and nightmarish dreams of the Sheriff of Nottingham.

The compound bow . . .

No one will ever compliment the compound bow on its looks. It is archery's answer to the proverbial 40 miles of bad road. But you don't buy a compound bow as a centerpiece for a state dinner. You buy it because it is generally agreed to be the most dramatic improvement ever in modern sporting archery.

The compound bow shoots an arrow faster and with a flatter trajectory than any other bow type. Test shootings of a conventional bow and a compound invariably see the arrow from the compound penetrate a target at least four inches deeper than the conventional arrow.

Deeper penetration translates to quicker and cleaner kills, with less crippling loss. Since the most strident argument against bowhunting is that it is "inhumane" and leads to crippling, the compound is an obvious improvement.

North Carolina bowhunters, in common with bowhunters everywhere, have adopted the compound bow almost universally, but there are exceptions. Dayne Welborn, a 25-year postal worker and former president of the North Carolina Bow Hunters Association, has bow hunted big game all over the United States and Canada.

He didn't like the looks of a compound bow the first time he saw one. "It was an Allen, heavy and awkward-looking and I remember thinking I didn't want to carry one of those in the woods with me. It looked like a piece of machinery."

But Welborn gave in and used one for eight years. He killed deer with the compound, but a few years back, he returned to a recurve bow, the type he started with in 1959 when he was 16, only a few years after the first North Carolina bow season.

The Bow COMPOUNDED

"Maybe it's tradition, maybe it's getting back to basics," he says. "With the compound I seemed to lose touch with the real purpose of bowhunting. I felt like I needed to develop my skills to practice woodsmanship. You're out there experiencing nature. I don't use sights with the recurve as I did when I used the compound."

When Welborn returned to instinct shooting, "Folks said, 'Hey, you're gonna miss some deer,' and I told them, 'Hey, I miss some deer now.'"

Missing deer is what inspired H. W. (Wilbur) Allen, once of Kansas City, later of the tiny little southwest Missouri town of Billings, to invent the compound bow in the 1960s.

Allen was laid off from an airplane wing factory and he and his wife then turned to making the wire baskets used in flower arranging, which was his occupation when the buck jumped the string. A compact, unremarkable man in looks, Allen lost a nice buck because it jumped out of the way of an arrow shot from a conventional recurve bow.

Allen thought about the problem and decided to solve it. It was a classic case of not getting mad, instead getting even. He didn't know much more about physics than the average high school B-student, but he thumbed through a borrowed high school physics textbook.

He found two formulae: Force x Time Applied (or Distance Applied) = Velocity; and Velocity x Mass Weight of Projectile = Impact Force. Now, unless you're a physics freak, that means little. But it led Allen to experiment with the use of cams—basically, a block-and-tackle arrangement, which has been used for more efficient energy for a long time. By drilling the axle hole of the cams off-center, Allen realized the "letoff" effect that allows a bowhunter to hold at full draw much longer than with any other type of bow.

His invention was a spider web of wires that played over the offset or "eccentric" cams (no doubt most who saw the prototype thought Allen was far more eccentric than his cams). The prototype compound bow was as ugly as a blind date arranged by your worst enemy. It was painted flat black and was blocky and looked like something that Rube Goldberg would have rejected as too outlandish.

Bowhunters by their nature have avoided advantage—if they wanted maximum advantage, they'd hunt with a rifle. Today, every bowhunter knows what a compound is and most own them, but in the late 1960s, bowhunters didn't understand the compound or hated them for their looks.

Ironically, the compound bow was considered a mechanical aid to archery which made it illegal in Missouri, the state of its invention, until Allen convinced the Conservation Commission that it was not a mechanical device, merely a law of physics, applied in a new way.

Georgia took even longer—until the mid-1970s—to recognize the compound as a legal bowhunting weapon. Scott Osborne, deer project leader for the

LLOYD B. HILL

***The compound bow** is regarded as the most dramatic improvement ever in sporting archery and gives modern bowhunters an edge when pursuing trophy deer like this handsome buck (right). One of the compound bow's main advantages over older recurve bows is its ability to shoot arrows faster with a flat trajectory.*

N.C. Wildlife Resources Commission, worked for the U.S. Fish and Wildlife Service in Georgia before coming to North Carolina. He began seeing compounds during special hunts at Blackbeard Island National Wildlife Refuge, though they were just for show since they couldn't legally be used.

Osborne, a bowhunter, uses a compound today, but still shoots his recurve bow. He knows many bowhunters who didn't make the switch to the compound—even some who shoot longbows, the bow of Robin Hood, William Tell and Agincourt.

Despite this early bow's relative inefficiency compared to the later recurve bow and, especially, the compound, some amazing hunting feats have been accomplished with longbows.

Dr. Saxon Pope and his hunting buddy, Art Young, for whom the archery record-keeping body Pope and Young Club is named, conspired to kill a grizzly bear in 1920. Both used 75-pound-pull longbows with birch-shafted arrows. The first bear they shot needed a backup gun to finish it. The bear had five arrows in it, almost all of which would have killed it—but not before it charged the two hunters and their guide.

Fred Bear, probably the most famous bowhunter of all time, died in 1988 at 86. He killed virtually every large game animal with an arrow, but is most remembered for his 1966 polar bear take with a recurve. It was his third try for a polar bear and was filmed for ABC's "American Sportsman" television program. It was a one-shot kill—perhaps a reflection of bow improvements over 46 years or perhaps just luck.

Within a few years of that hunt, Fred Bear would pay Wilbur Allen a great deal of money for manufacturing rights to the newfangled compound bow.

About 25 percent of North Carolina's estimated 275,000 deer hunters are bowhunters and well over half use compounds. "You get better speed and accuracy with a compound bow," Osborne says. "I think a lot of hunters have a problem with a recurve. They believe they can start a couple of weeks before the bow season and shoot a few hours and go out and kill deer. But to be able to hunt with a recurve effectively, you have to keep a bunch of muscle groups in tune."

It takes just as much strength to draw a compound as it does a conventional recurve bow of the same pull, but once the draw passes the fattest part of the two eccentric cams (those round wheels) on the limbs, the energy needed to hold the bow at full draw relaxes by (these days) up to 75 percent.

You can hold one at full draw forever. No longer does the bowhunter's arms have to quiver like quickmud as he waits in agony for a buck to step into the open. And there is stored energy in the bow so, when you release, the arrow flies with about 50 percent more speed than an arrow from a conventional bow and, consequently, has a flatter trajectory.

Tom Jennings, technical editor of *Archery World* magazine, wrote a piece about Allen's invention in 1967, before Allen had sold a single bow. Within a couple of years, Allen was producing 350 bows a year (with a demand of 2,000). Allen also granted Jennings production rights in appreciation for the publicity.

JOEL VANCE

Wilbur Allen (above) *invented the compound bow in the 1960s. Early models were ugly and cumbersome but their effectiveness was undeniable. Some established bowmakers either tried to steal Allen's design or belittle it, but the feisty inventor successfully met their challenges.*

Subsequently, Allen franchised other archery companies, but several simply stole the design and Allen went after them with a legal ferocity. He may have been unremarkable in appearance, but his ingenuity was unquestioned and, after a few court fights, the losing bowmakers didn't question his willingness to defend his cub.

Allen devised and built more than 100 jigs and patterns so the newly leased plant in Billings could operate. The plant was no modern factory—it was a ramshackle little corner building filled with wood dust, with the decor of a 1940s filling station.

Allen really didn't want to manufacture bows. He would have preferred to franchise their production (which he ultimately did after all the other obstacles were knocked down). But the big archery companies fought him the same way the automotive and oil companies would fight someone who invented an engine that runs on air. One manufacturer wrote a blanket letter to archery associations saying that the compound would destroy the conventional bow and said, "The state game departments

The Bow
COMPOUNDED

will no doubt notice the closing of the gap between gun and the so called bow and change regulations accordingly."

Actually, conservation agencies ultimately were convinced that all the compound does is use the archer's applied force more efficiently than any other bow in history—it doesn't add a thing.

So, there were no changes in regulations. Today, some bowhunters have abandoned their compounds for more primitive bows. Osborne says, "It's like a lot of things, people go through phases. Now they're getting back to tradition."

Allen died in 1979 and his widow, Elizabeth, made a generous contribution which resulted in a 300-acre Missouri wildlife area. In keeping with Allen's passion, the area has been restricted to bowhunting for deer.

Today's compound is far advanced over the first Allen bows—the letoff is up to 75 percent, compared to Allen's 20 percent, it has easily adjustable draw lengths and is built of graphite and titanium and other space age materials.

Bowhunters follow their sport for different reasons. Bowhunting lengthens time in the deer woods. Gun season goes quickly, but bow seasons are longer. And there is the chance to add to the game bag. The North Carolina bow season for deer opens Sept. 9 and runs varying lengths, depending on the area of the state. Bag limits on deer also vary from two to five, depending on the area.

For most bowhunters, the attraction is pitting their hunting skills more intensively against a wary game animal. Bowhunting is self-limiting, analogous to fishing only with dry flies or bird shooting only over points.

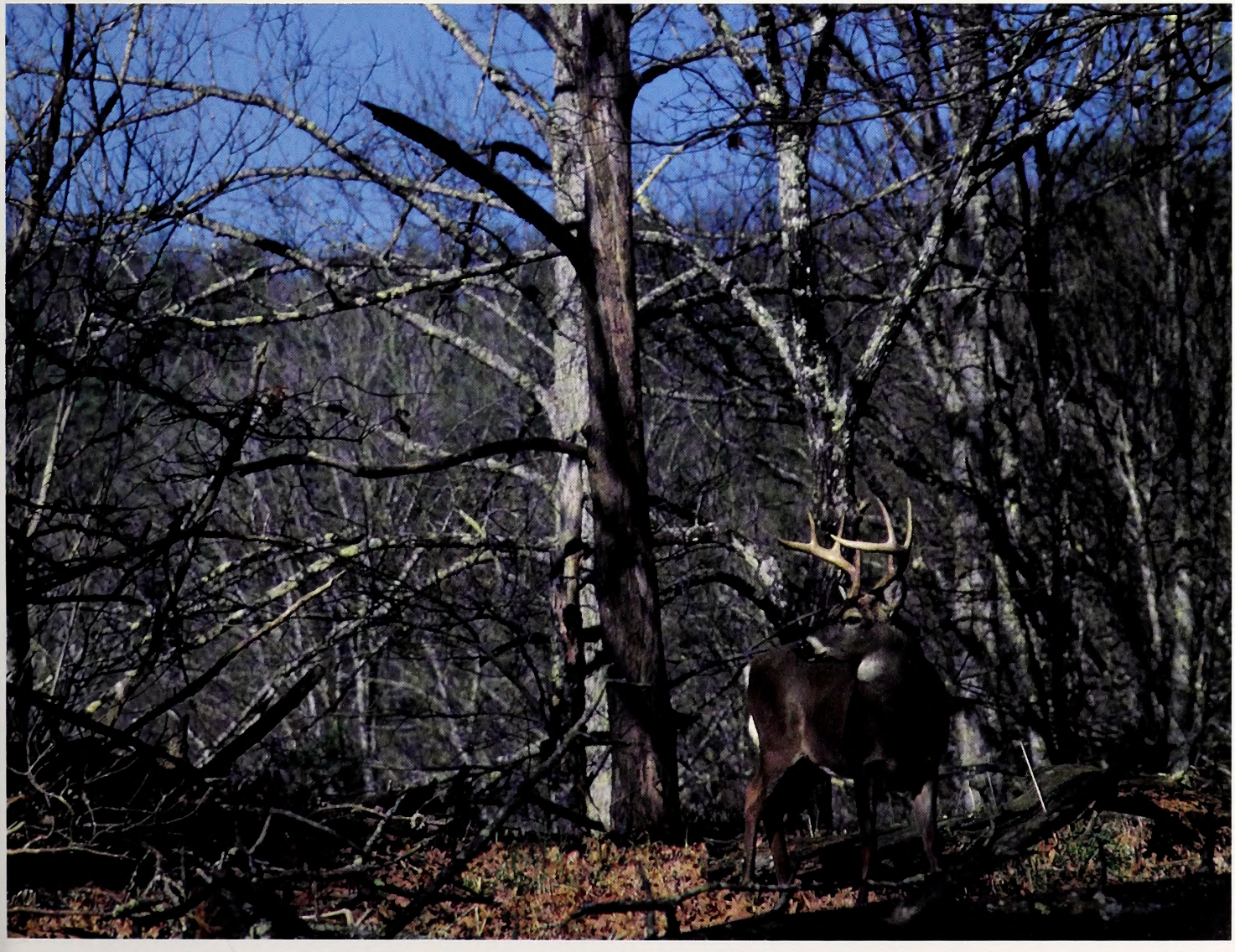
Each bowhunter decides what compromises to make toward modernity—type of arrow (some use obsidian or flint points), stabilizers, sights (the Plains Indians didn't have laser sights), but most of all, type of bow. Longbow, recurve or compound—that's the crux of the question.

For most bowhunters today, the compound is an acceptable compromise. In fact, it's rare to find any other style—either in use or for sale. In a recent archery trade magazine, there were no advertisements for bows other than compounds.

And, right down at the bottom of one of the high-tech ads in that archery business magazine, there was the tiny, telling phrase: "Licensed under Allen Patent No. 3486495." ⊠

***Another of the compound bow's** advantages is its "let-off" effect that enables a bowhunter to hold it at full draw much longer than any other type of bow (opposite page). This ability helps accuracy and minimizes hunter movement when a wary buck is slowly creeping into range (below).*

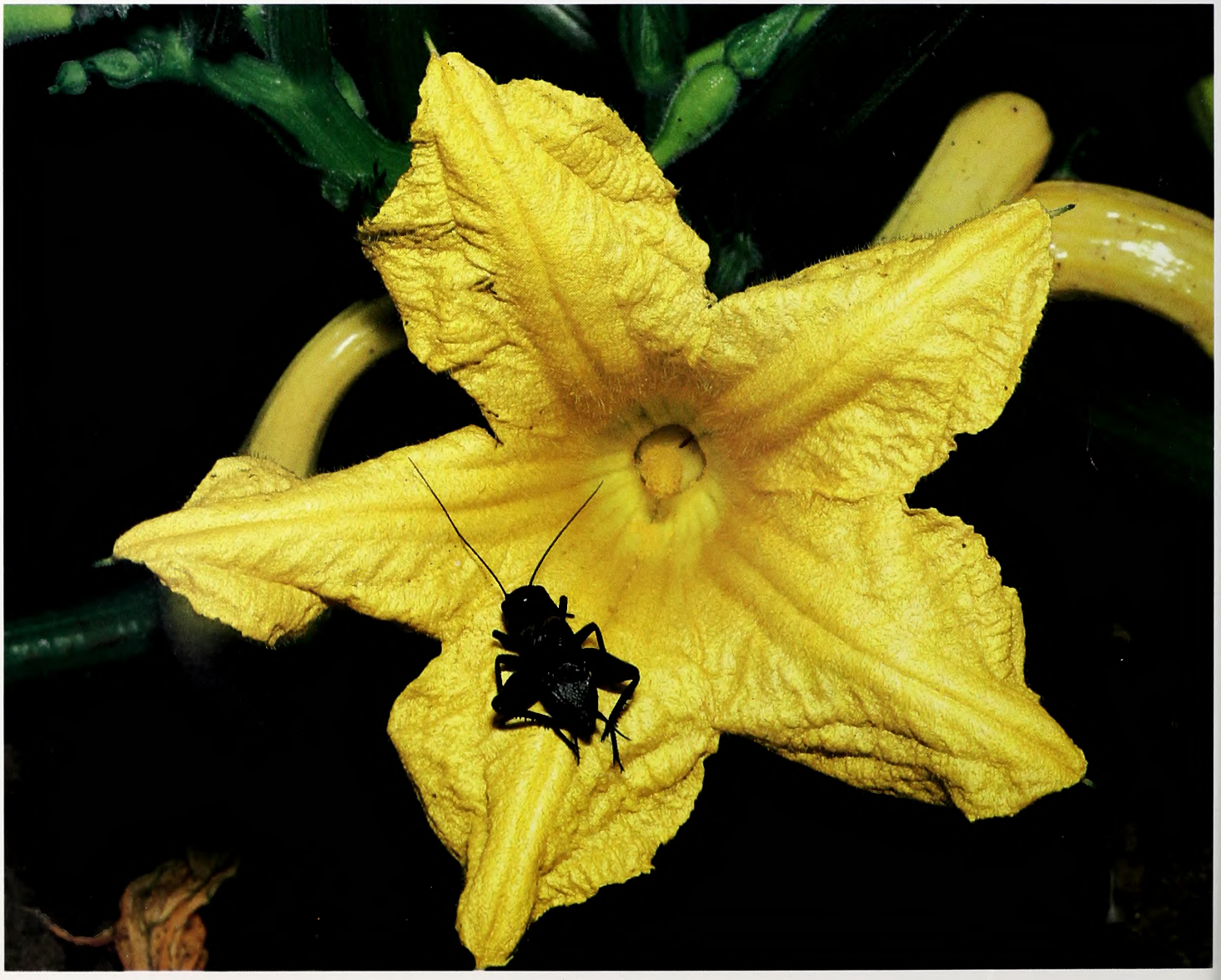
LLOYD B. HILL



FIDDLERS IN THE FIELDS

What would late summer be without its buzzing chorus?
Who said delightful?

written and photographed by Harry Ellis



A short-horned grasshopper *sits on its colorful perch. Among the* Orthoptera *(crickets, katydids and grasshoppers), only the males sing but both sexes have good hearing.*

When the revolving wheel of the seasons has turned to the slow, lazy days of late summer and heat waves shimmer over the dusty roads, the birds, one by one, fall silent. The robins, orioles, thrushes and tanagers quietly retire into the deeper woodland shade because the feverish activity of nesting and rearing of young has largely ceased. But to replace the diminishing songs of the birds, there rises, by night and day, a new, swelling symphony of sound—the orchestra of fiddling crickets, katydids and grasshoppers, and of drumming cicadas.

The sounds made by insects are commonly referred to as "song," but to be strictly accurate, these sounds might be best described as "instrumental music." Insects were the first creatures to produce sound in a world that had previously known only the roaring of ancient volcanoes, the pounding of ocean surf and the screaming of violent winds. Long centuries lay ahead before the first frog croaked or bird sang.

Chief among these instrumentalists are members of the most musical order of insects known, the *Orthoptera*, which includes the crickets, katydids and grasshoppers. Their sounds are made by the rasping together of different parts of their armored bodies, like the drawing of a rosined bow across a violin string. They are the real fiddlers of the insect world. Organs of hearing are generally present in both males and females. In crickets and katydids, the "ears" are located on the front legs and in certain short-horned grasshoppers, on the sides of the thorax.

If you pause for a while in almost any meadow in late summer, you will hear a continuous running murmur of countless millions of these insects, such an outpouring of sound that no single voice can be separated from the steady summer hum. As a general rule, it is an all-male chorus, for in most species of the *Orthopterans*, the females have no sound-making organs and are thus condemned to perpetual silence.

As the sun sinks lower in the sky on any warm evening in late summer or early autumn, listen as a few black field crickets (*Gryllus*) begin tuning their fiddles for the nightly concert. When the land lies in darkness, the air is filled with a resounding chorus. Sometimes the members of a species will blend their chirpings in a synchronous harmony, "keeping time" as though being led by a skilled musical conductor. Ultimately, other night singers—fiddlers great and small—join the cricket glee club until the night echoes with great pulsing waves of sound.

To most individuals the steady chirping of a cricket is relaxing and soothing to ruffled nerves, like the sound of rain on a roof or the booming of the surf against an old sea wall. To me, no sound could be more pleasant when I am drifting toward sleep than a cricket chirping outside my window. But when he comes inside the house and gets under my bed, that is entirely too much of a good thing. Though he may be singing a ballad about the harvest moon, I always try to locate the little ventriloquist and take him outside.

The cricket has been eulogized by writers and poets for generations, as in Charles Dickens' classic, "The Cricket on the Hearth." John Keats in one of his sonnets calls the song of the cricket, "The poetry of earth," and Nathaniel Hawthorne, listening to the song, remarked, "If moonlight could be heard, it would sound like that."

The chirp of a cricket is produced by the male as he raises his wings. A scraper on one of his wings is rasped across a series of transverse ridges—the file—on the other wing. It is by the power of his singing that the male wins the female. After mating, the female uses her needlelike ovipositor to place her eggs deep in the soil. At the first hard freeze almost all of the adults perish, but a few overwinter deep under woodpiles, or sometimes inside our houses, for they seem to have developed a special fondness for living close to man.

Living in trees and bushes are several species of tree crickets (*Oecanthus*), all light green in color, but of such a pale shade as to appear an almost ghostly white. Though their sweet, mellow music is heard on almost every late summer and early autumn night, the musicians themselves are little

Autumn-blooming *yellow squash flower hosts a black field cricket. Crickets add their steady chirping to the general chorus of late-summer insect music. Though many different species are members of this chorus, each insect knows only its own songs.*

The snowy tree cricket *has earned the name the "temperature cricket" because the number of its chirps varies with the temperature. Crickets sometimes synchronize their chirps, keeping time in a great pulsing harmony.*

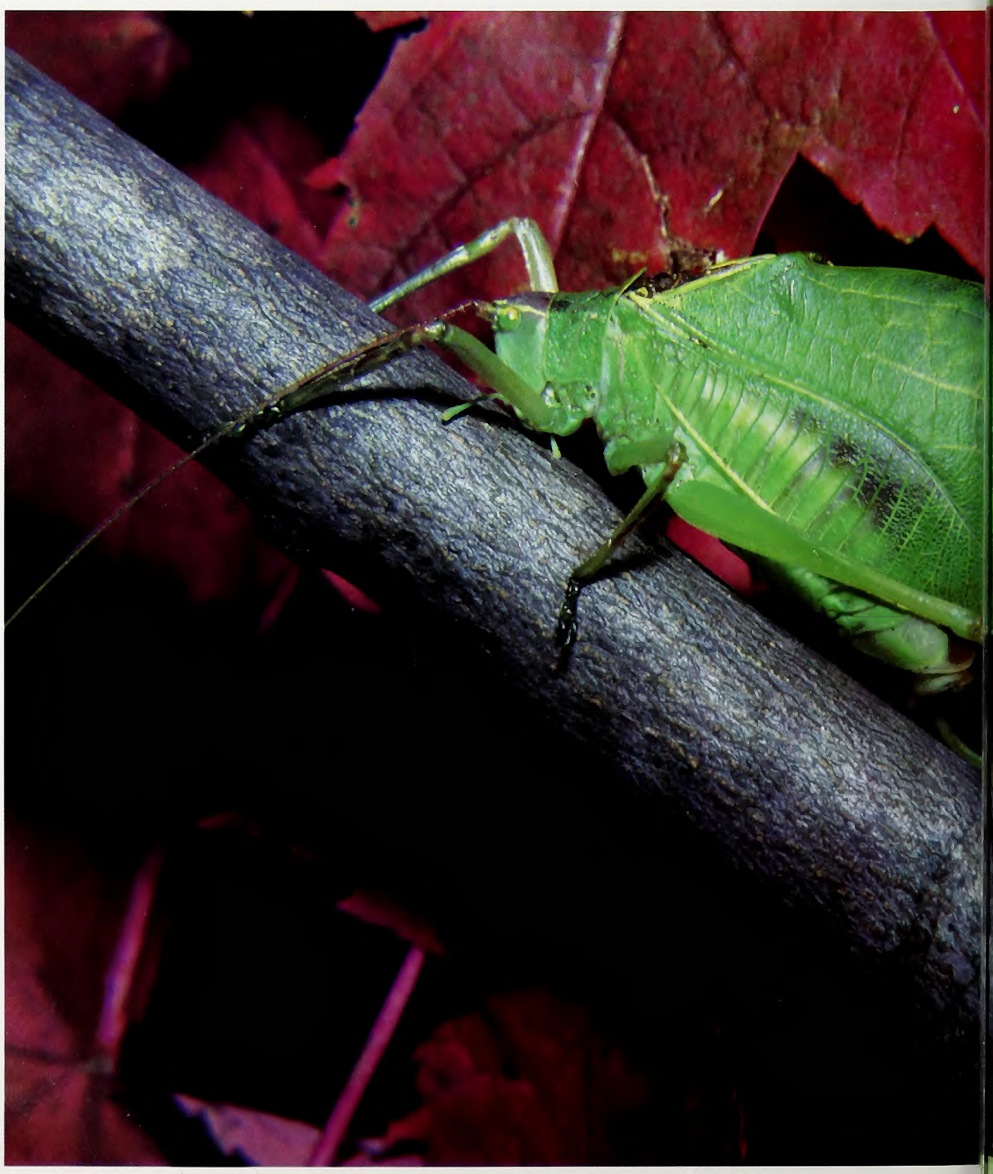
The mole cricket *takes its name from its mole-like forelegs which it uses to dig burrows. It spends much of its time underground, emitting a soft "gru gru" sound from the entrance to its burrow. Insect songs sound differently depending on their purpose. The courtship song a male sings to a female is different from the rivalry songs sung by males.*

known to most of us. Their notes are usually long musical purring sounds or continuous trills, but one species, the snowy tree cricket (*Oecanthus fultoni*), has a song that is heard in beats of sound rather than extended trills. The number of these beats per minute varies so definitely with the temperature that it has earned the name "temperature cricket." One formula for determining the prevailing temperature is to count the number of chirps in 15 seconds and add 40, which should be the correct temperature within two degrees Fahrenheit.

With spade-like front feet marvelously adapted to digging, the strange-looking mole crickets (*Gryllotalpidae*) live in underground burrows like true moles, usually in swampy areas and along the banks of streams, and they are seldom seen by humans. They emit their soft "gru-gru" notes from the entrances to the burrows, where they retreat at the slightest disturbance. My introduction to the music of the mole cricket came late one evening beside a small lake, many years ago. The rather monotonous sounds that I believed to be coming from some species of small frog seemed to issue almost directly from under my feet, yet all my efforts to locate the singers were in vain. Not until long afterward did I learn the true nature of the mysterious "voices."

Among all the night musicians, the real aristocrat is the true katydid (*Pterophylla camellifolia*), a handsome dark green creature with oval wings and long thread-like antennae. Night after night the darkness echoes with sound, as the males argue whether "katy-did" or "katy-didn't." The females, unlike most of their kin, are capable of making their own faint sounds but seldom do.

Like a violin bow, the male raises the upper wing and rasps its scraper-like edge

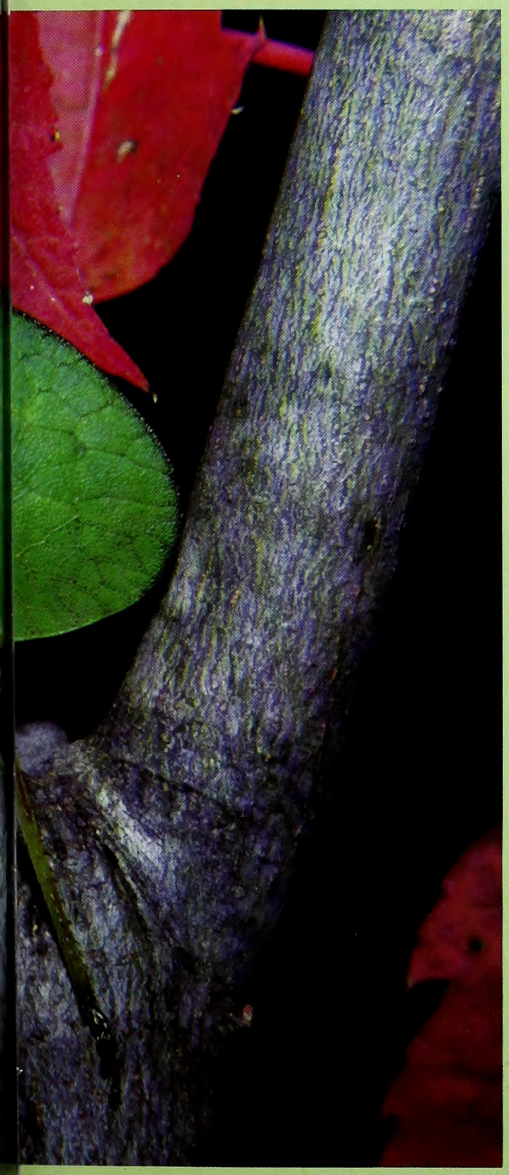


The true katydid (Pterophylla camellifolia) *produces an astonishing volume of sound for its size. Katydids live in the upper stories of trees and though most sing during the day, the true katydid sings at night, making the darkness echo with sound.*

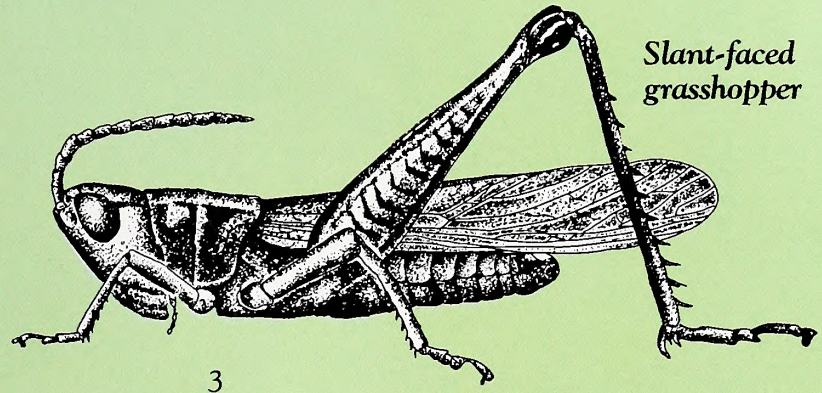
How They Fiddle

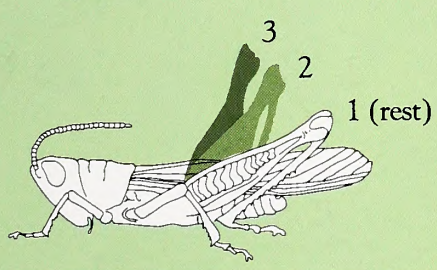
Insects use almost every conceivable part of their bodies to make sounds. Bees make audible hums with their wings when they fly, while termites communicate by banging their mandibles on the ground. A drum-like membrane in the abdomen of the cicada vibrates loudly, and one insect produces sound by expelling air in a pulsed stream.

Most of our summertime musicians (crickets, grasshoppers and katydids) are fiddlers. They produce their distinctive sounds by rubbing a scraper over a series of tooth-like structures or pegs. This music-making process is called stridulation and has been compared to the sound made by running your finger over a comb.



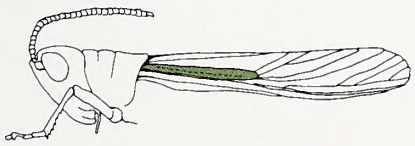
Slant-faced grasshopper

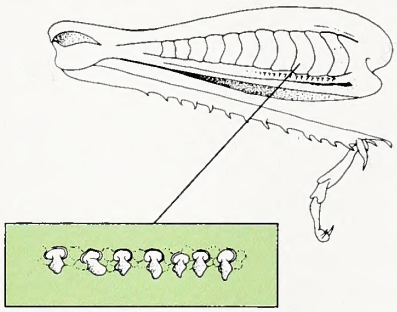




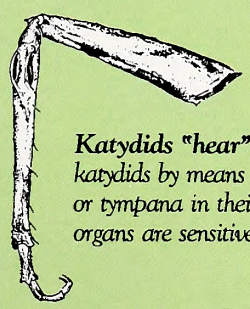
This short-horned grasshopper *makes its music by pressing its legs against its forewings and rubbing. A series of tooth-like pegs on the inside of the femur scrape across specialized veins on the forewings. The result is a loud, resonating sound.*

These details show the peg-like *teeth on the inside of the femur (right), and the vein on the wing (below). The wings act as resonators.*



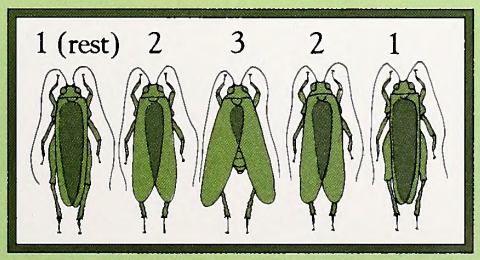


Katydid



Katydids "hear" *other katydids by means of oval eardrums or tympana in their forelegs. These organs are sensitive to vibrations.*

Among katydids *the tooth-like pegs are found on the undersurface of the left wing while the edge of the right wing acts as the scraper. Sound is produced when the wings are raised away from the body slightly and then opened and closed (positions 1, 2 and 3). When the katydid closes its wings, the scraper is drawn across the pegs, making a chirping sound. Crickets produce sound in a similar manner.*



across a file-like row of teeth on the other wing. With two rasps across the file he says, "katy-did"; with three rasps he contradicts himself and says, "katy-didn't." There are some country folks, however, who insist that he doesn't say "katy-did" at all, that what he really keeps repeating is "six weeks till frost" or "frost is near."

In addition to the file-and-scraper mechanism, a triangular area called the "drum mirror" is found on the back, where the bases of the wings overlap. This polished drum-like membrane picks up the vibrations of the wings and, acting like a miniature amplifier, magnifies an almost inaudible wing rasp into a sound that can be heard a quarter of a mile away.

True katydids live in the upper stories of trees and are rarely seen. On late summer and early autumn nights, they seem to be possessed by a special frenzy, as hour after hour the darkness is filled with their rasping music. Time for them is running out and the species must be perpetuated before a killer freeze comes to silence them all. Their lives are ending, but they cannot see the long, creeping shadows of the coming night. A summer to a katydid is not just a season but a whole lifetime.

There are many other kinds of katydids and their near relatives, the long-horned grasshoppers. Each species has its own characteristic sounds and musical ability. Many are daytime performers, making our sunlit meadows ring with their whirring music. The group includes the fork-tailed bush katydid which can play only one note, a high-pitched "zeep-zeep-zeep." The oblong-winged katydid produces a sound like that made when the teeth of a fine-toothed comb are drawn over a tight string. And the song of the comical-looking cone-headed grasshopper is an oft-repeated "zip-zip-zip." Though the short-horned grasshoppers or locusts can produce sounds, compared to their long-horned cousins they are second- or third-rate musicians at best; but the sounds they make are an obvious addition to the enormous volume of insect music of our summer meadows.

The cicadas, belonging to the *Homoptera* order of insects, are drummers rather than fiddlers. The music is produced by the male when, with powerful muscles, he sets in rapid vibration two drum-like membranes

The long-horned meadow grasshopper *produces music by rubbing its forewings together. The sounds created by the insect fiddlers communicate a variety of moods, from courtship to alarm and aggression, and can be heard over a distance.*

***Periodical cicada** dries its wings after being transformed from the nymph stage. While grasshoppers, katydids and crickets fiddle to make music, the cicada is the drummer in the band. Drum-like membranes on the sides of its abdomen vibrate when internal muscles are tightened and released.*

on the sides of his abdomen. The periodical cicada (*Magicicada septendecim*) spends almost 17 years deep underground as an immature nymph, toiling from root to root in eternal darkness. But at some specific time during the 17th spring, a mysterious signal sweeps through the earth, announcing to the innumerable legions that their "resurrection day" has come. Almost simultaneously millions of them crawl out of the ground and transform to winged adults, leaving their empty nymphal shells hanging to trees and bushes. No one who has ever entered a forest where the periodical cicadas were in full song could ever forget their dismal, earsplitting wails, like a hundred power saws ripping through seasoned wood. However, these mating calls last only a few weeks at most, for only a short span of adult life lies before them—a brief time to sing and mate and complete nature's plan. The annual cicada or "dog-day" harvestfly (*Tibicen* spp.) is well known for its rasping, drowsy drone during the hottest days of late summer. Its life cycle requires from two to five years for completion depending upon the species, but, because the broods overlap, a new generation hatches each summer.

Bees and wasps use their wings to create sounds that are a means of communication

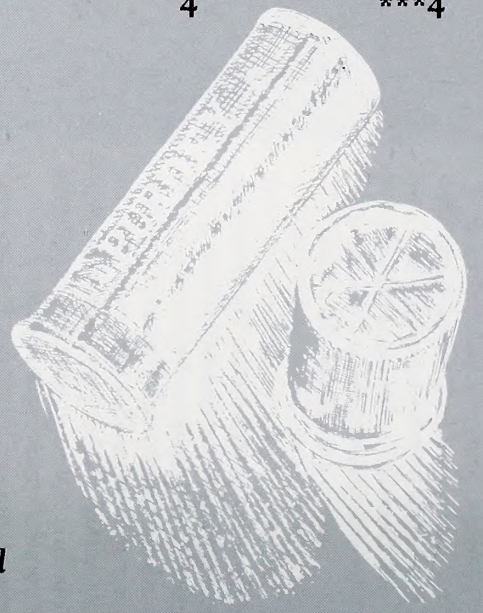
and expression of their moods, and, in a very real sense, a kind of insect music. An experienced beekeeper is aware that his bees habitually buzz with differing sounds and pitches according to their prevailing mood. There is the normal drone of contentment; also the swarming sound familiar to all apiarists; then there is a peaceful but unique hum while they are gathering food; and, of course, there is the furious, angry roar when they are disturbed. These sounds are communicated to others of their kind in the bee society, enabling the individuals to vary their actions accordingly.

***Honey bees also make sounds** that convey their moods and communicate with others of their kind. These social honey bees may hum quietly one moment and then buzz loudly when disturbed.*

While I know that the songs of most insects are mating calls to bring the sexes together, sometimes on a warm night when I stand under the big trees near my backyard and listen to the night voices, it seems as if they are singing for the sheer joy of being alive. Hour after hour their music fills the air, but it is the calm before the storm, for it will end in silence when the first black frost blights the land. Then will come blizzards that screech and howl and cry in the night, but the eggs of millions of insects will have been safely hidden away and protected from the cold, waiting for the warmth of another vernal sun. Then new generations of the insect musicians will appear upon the scene and make other summer evenings a bit richer and more delightful for all of us. ☒

North Carolina Hunting Seasons 1991-92

Species	Hunting Season	Daily Limit	Possession	Season
Crow	Thurs., Fri., Sat. of each week from July 1 to Feb. 28 and Thurs., Fri., Sat. of each week from June 1 to June 30 plus Labor Day and Christmas Day		No restriction	
Dove	Sept. 2-Oct. 5 (all day) Nov. 25-Nov. 30 (all day) Dec. 13-Jan. 11 (all day) Shooting hours are from one-half hour before sunrise until sunset.	12	24	None
Rails, Moorhens and Gallinules				
Moorhens and Gallinules	Sept. 2-Nov. 9	15	30	None
Clapper Rail, King Rail	Sept. 2-Nov. 9	15	30	None
Sora Rail, Virginia Rail	Sept. 2-Nov. 9	25	25	None
Deer		2	4	***4
Bow and Arrow	Sept. 9-Oct. 5 (*Eastern) Sept. 9-Oct. 5 and Oct. 14-Nov. 23 (*Western) Sept. 9-Nov. 9 (*Central) Sept. 9-Nov. 16 (Northwestern)			
Muzzleloading	Oct. 7-Oct. 12 (*Eastern) Oct. 7-Oct. 12 (Western) Nov. 11-Nov. 16 (*Central) Nov. 18-Nov. 23 (Northwestern)			
Gun	Oct. 14-Jan. 1 (*Eastern) Nov. 18-Jan. 1 (*Central) Nov. 25-Dec. 7 (*Northwestern) Nov. 25-Dec. 14 (*Western)			
Gun Either Sex and Special Either Sex	See *1991-92 North Carolina Inland Fishing, Hunting and Trapping Regulations Digest*			
Black Bear	See Regulations Digest	1	1	1



Wild Boar	Oct. 14-Nov. 23 and Dec. 16-Jan. 1	1	1	2
Gray Squirrel	Oct. 14-Jan. 31	****8	16	75
Fox Squirrel	Oct. 14-Dec. 31 (Only in 18 counties. Season closed elsewhere. See *Regulations Digest*)	****1	2	10
Common Snipe	Nov. 14-Feb. 28	8	16	None
Quail	Nov. 23-Feb. 29	10	20	None
Ruffed Grouse	Oct. 14-Feb. 29	3	6	30
Raccoon and Opossum	**Oct. 14 (sunrise)-Jan. 31 **Oct. 21 (sunrise)-Feb. 29	No restriction on opossum. See *Regulations Digest* for bag limits on raccoon.		
Rabbit	Nov. 23-Feb. 29	5	10	75
Rabbit—Box Trapping	Nov. 23-Feb. 29			
Pheasant—Nonnative Male Pheasant Only	Nov. 23-Feb. 1	3	6	30
Woodcock	Dec. 5-Jan. 18	3	6	None
Bobcat	**Dec. 16-Jan. 31 **Dec. 16-Feb. 8	No restriction		
Fox	See *Regulations Digest*			
Groundhog	No closed season or bag limits.			
Wild Turkey Bearded Turkey Only	**April 11-May 9	1	2	2
Resident Canada Geese	Sept. 3-Sept. 10 (west of I-95 only, permit required)	2	4	None
Migratory Waterfowl	Unavailable at this time; Federal regulations may be obtained by contacting license agent or writing N.C. Wildlife Resources Commission after October 1, 1990.			

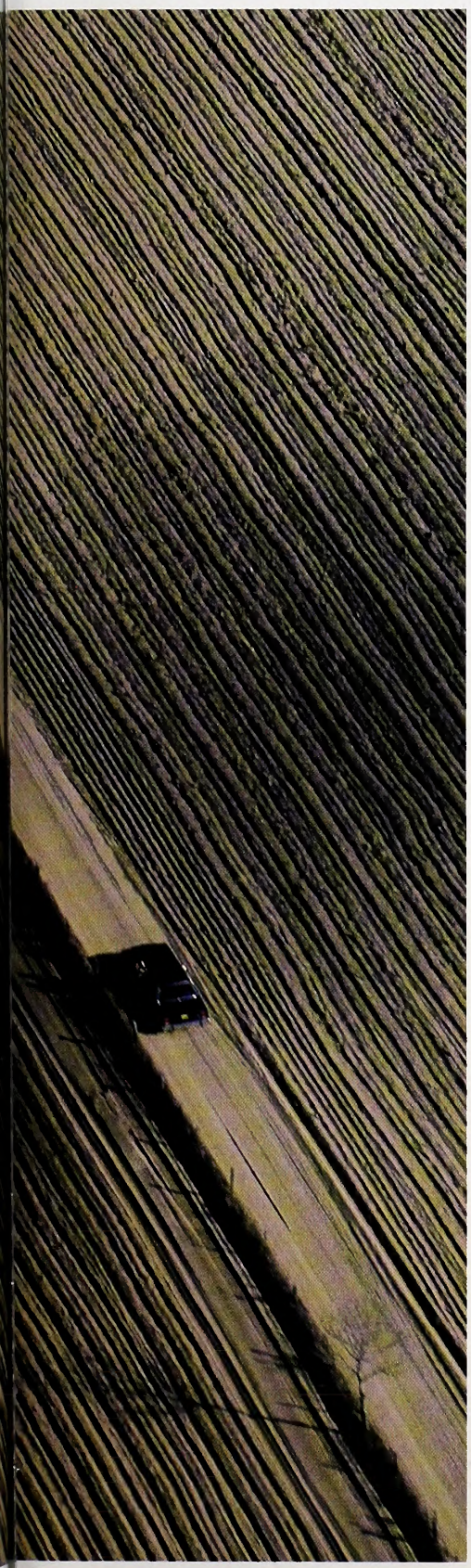
* See *1991-92 North Carolina Inland Fishing, Hunting & Trapping Regulations Digest* for approximate boundaries of Eastern, Central, Northwestern and Western deer seasons. For a copy of the *Digest*, write: N.C. Wildlife Resources Commission, 512 N. Salisbury Street, Raleigh, N.C. 27604-1188.

** Season varies from location to location; see *1991-92 Regulations Digest*.

*** An additional antlerless deer may be taken during established either-sex seasons in Eastern and Central areas.

**** Total limit of 8 squirrels per day of which one can be a fox squirrel.

THE LAW ON HIGH



A Super Cub is no stealth fighter, but Wildlife Commission airplanes have nabbed a lot of unsuspecting law violators.

written by John Manuel
photographed by Ken Taylor

In March 1989, officers George Ford and John Wishon of the N.C. Wildlife Resources Commission's Division of Enforcement were patrolling a stream near Elkin when they spotted two youths fishing. It was closed season for trout, and realizing they had been caught in the act, the boys took off on foot. They reached a four-wheeler parked nearby and headed off into woods.

The two officers returned to their vehicles and radioed Gary Carter, a pilot with the Division of Enforcement who was patrolling the region from the air with observer, Lloyd Beaver. Carter banked his Piper Aircraft into a turn and circled until Beaver caught sight of the four-wheeler.

For the next three hours, hunter and hunted played a game of cat and mouse through the rugged foothills of the Blue Ridge Mountains. The youths made repeated attempts to break out onto a road, but were foiled by the pursuing officers. With only an intermittent view of where the boys were headed, Beaver directed Ford and Wishon to block off escape routes with their vehicles. The four-wheeler charged back into the woods, seeking another way out. Finally, the officer drove the suspects onto a ridge with dense laurels on one side and a steep bluff on the other. The four-wheeler bogged down and the officers, pursuing on foot, were able to nab the suspects. Carter circled overhead to make sure the arrest was completed safely, then headed off in search of other violators.

Not all enforcement actions by the Wildlife Resources Commission involve chases, and few chases involve this level of excitement. However, the ability of Carter and Beaver to find the boys and direct their capture is but one example of the versatility of aircraft in enforcing the state's wildlife regulations.

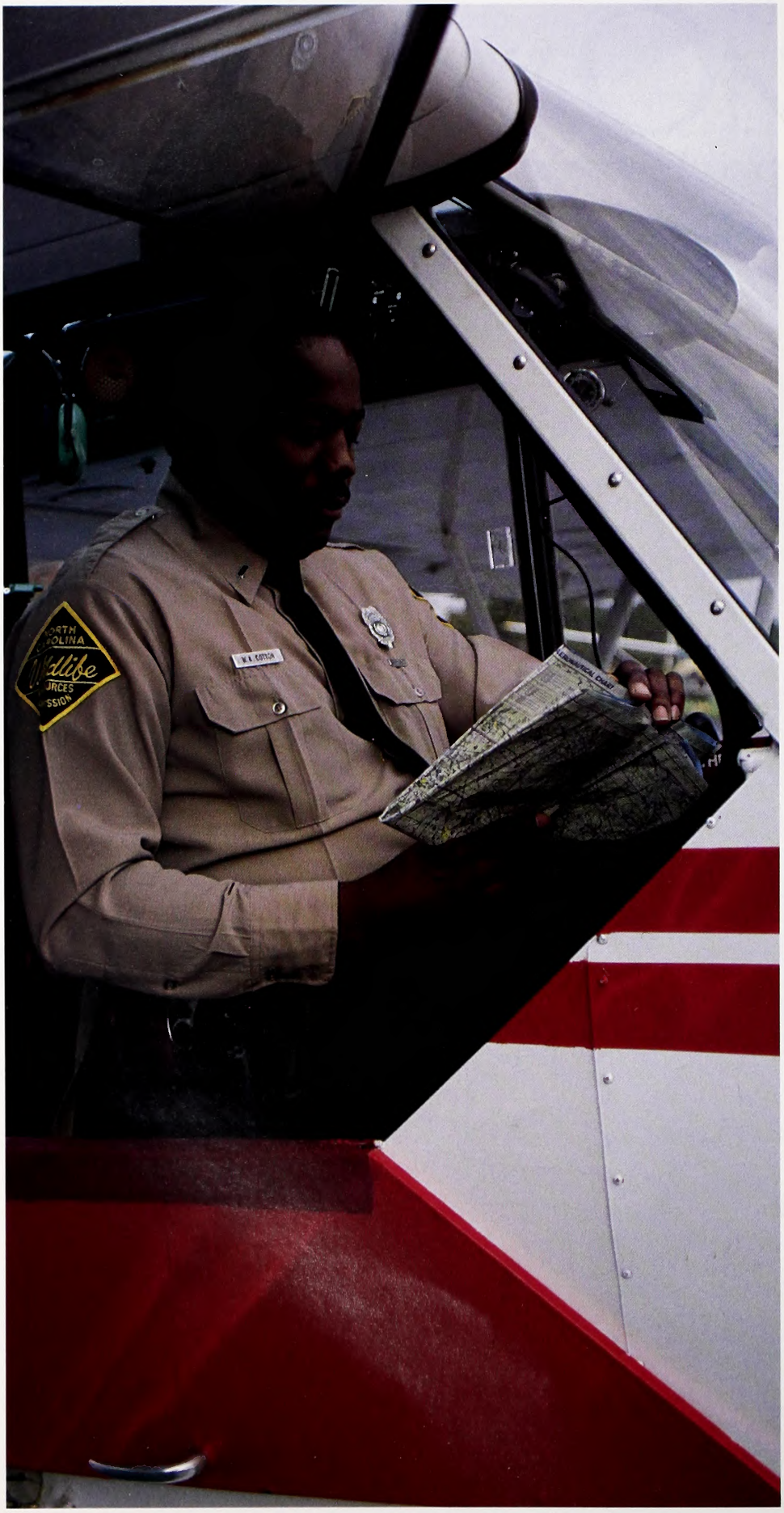
The Wildlife Resources Commission began using aircraft approximately 30 years ago. At that time, their primary use was to assist ground units with enforcement of small-game hunting regulations, especially for rabbit and quail. According to Major Jerry Rich who oversees the Division of Enforcement's aircraft operations, it was not uncommon on any Saturday in November for one aircraft to keep three or four ground vehicles busy all day checking rabbit-, quail-, and squirrel-hunting activity. However, the number of these game animals has declined over the years, leading to a corresponding decrease in their hunting. Today, deer have become the most popular game species and the use of aircraft has changed to monitor this type of hunting.

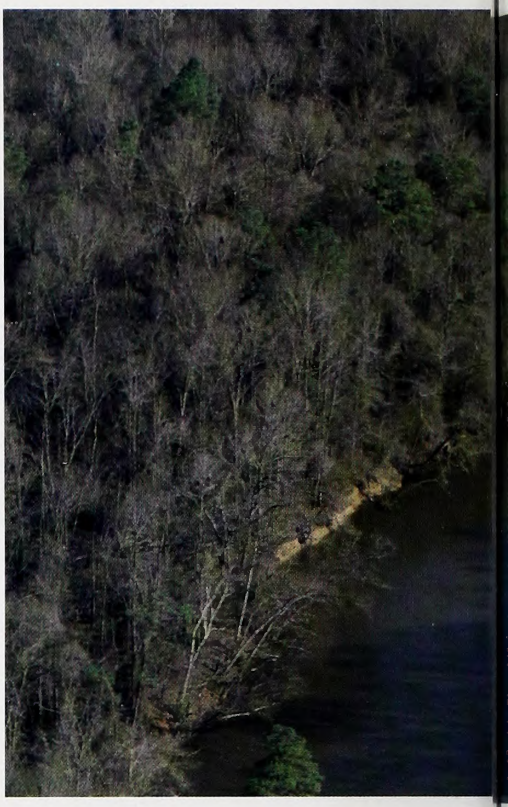
In North Carolina, most illegal hunting of deer is done at night with the aid of spotlights mounted on moving vehicles. Aircraft are ideally suited for detecting this type of activity.

"You would just be amazed at how much you can see from up there at night," says Gary Carter. "I can pick out a spotlight sweeping a field for deer from about eight or nine miles away."

Night flights make up greater than 50 percent of the enforcement hours flown by aircraft. A typical night-hunting detail consists of a single aircraft manned by a pilot and an observer, and between two and five patrol vehicles with two men in each unit. The observer sits behind the pilot, giving both a clear view to either side of the airplane. Having an observer allows the pilot to fly the plane unencumbered, and it frees him from having to make court appearances when arrests are made.

***Wildlife law enforcement** is often better accomplished in tandem—officers in aircraft working with officers in cars. The aerial officers can spot violators and direct their colleagues to nab suspects. Aerial enforcement is especially advantageous at night, when most of the missions are flown.*





***One of four pilots** employed by the Wildlife Commission, enforcement officer Walter Cotton (left), flies a Super Cub (above) out of Hickory. Mechanically dependable, the small plane is highly maneuverable and can nearly hover over an area.*

When a spotlighter is detected from the air, the observer radios the nearest ground unit and directs it toward the suspect. Ground units have usually been prepositioned in high-activity areas. They will try to approach the spotlighters without being seen. Unless the hunters are caught in the act by the ground units, positive identification is difficult and the arrest will not hold up in court.

If the suspect runs, the pilot must keep him in sight while the observer directs the ground units in pursuit—a real test of the pilot's flying skills and the observer's knowledge of the countryside. "A good observer will know practically every curve, hill and house in an entire county and will keep calm on a two-way radio," says Major Rich.

Once the suspect is apprehended, the pilot will circle at a distance to make sure the arrest is completed safely. Most violators plead guilty to the charges and the case is usually settled without the role of the airplane ever being known.

Other than their eyes and a pair of binoculars, pilots and observers use little in the way of fancy equipment. An on-board

LORAN computer gives the pilot the exact distance and direction to preprogrammed points, such as local airfields, and up to a dozen other positions of his choosing, such as stationary ground units. Before the outbreak of war in the Persian Gulf, officers flying out of Clinton were given access to infrared night-vision goggles care of the U.S. Army, but they have since been taken back.

"Those goggles were great," says Charles Adams, a pilot with the Division of Enforcement who flies out of Clinton. "I could see a man letting his dogs out of his truck from 3,500 feet in the air in the pitch black dark."

Pilots are hired from the ranks of the Wildlife Enforcement Division. They are all commercial instrument-rated for single-engine airplanes. Currently, the agency has four pilots—Gary Carter, Charles Adams, Walter Cotton and Joe Newman. Jerry Rich oversees all aircraft operations and flies occasional patrols.

Given the apparent glamor of the job, you'd think that many of the Division's officers would be clamoring for jobs as pilots or observers. But Carter says the special requirements of the job combined with the rather cramped quarters of the Super Cub deter many from flying.

Designed in the 1940s for aerial surveillance by the military, the Piper Aircraft "Super Cubs" used by the Division of Enforcement are veritable antiques. The skin is made of fabric stretched over a steel frame. The front seat is tight for 6-footers like Carter, and the observer's seat behind is even worse. The Super Cub is a "tail dragger," meaning it taxis with a tail wheel on the ground. Tail draggers tend to careen on the runway in crosswinds—"like driving a car backward," says Carter. That trait lead to an accident in 1989 in which one of the Super Cubs was destroyed.

Despite its drawbacks, the pilots who have flown the Super Cub for any length of time fall in love with it. The Division has three Super Cubs, Carter's based in Burlington, Adams' in Clinton and Cotton's in Hickory.

"You couldn't find anything that's more fun to fly," says Carter. "They are very dependable mechanically. You can fly them slow and bank them hard. The book says they'll fly as slow as 42 or 43 miles per hour, but I know they can go slower. That's important for surveillance work where you need to hover over a target."

Carter's plane was built in 1966 and has been flown over 13,000 hours. While a FAA-certified mechanic does the regular scheduled maintenance, Carter performs preventative maintenance and knows the plane's quirks like he knows his own.

"These planes deserve recognition," he says wistfully. "They are a piece of aviation history. Other pilots are always coming up to look at them and touch them. When these three are gone, we won't get any others."

The Super Cub that was destroyed in 1989 was replaced by a Maul, a modern four-seater aircraft built in Georgia. While Carter concedes the Maul is probably a good airplane, it's clear where his heart lies.

"I suppose the observers like it," he says of the Maul. " They get two seats to themselves."

In addition to nighttime enforcement, the Division's aircraft are also used to monitor a variety of daytime activities. These include small-game hunting, trapping, waterfowl hunting, closed-season trout fishing and locating baited duck blinds and dove fields. "It's often very easy to spot corn in the water in front of duck blinds," says Major Rich.

The effectiveness of air patrols to the state's wildlife enforcement efforts is indisputable. For the 12-month period beginning July 1, 1990, through June 1991, the four aircraft were involved in 1,578 enforcement actions. Total daytime arrests numbered 503—an average of one for every 1.13 hours flown. There were 614 nighttime arrests, or one for every 1.81 hours flown. Of these, 172 were for illegal night deer hunting.

Although hard to measure, wildlife officers also feel the air patrols have a strong deterrent effect. "The word gets out very quickly when we are in an area flying patrols," says Major Rich. "The very fact of our using the planes probably deters twice as many violations as we actually catch."

While 90 percent of flying time is for enforcement work, the aircraft are also used by other divisions of the N.C. Wildlife Resources Commission. The Conservation Education Division uses the aircraft to take still photographs for use in this magazine, as well as movies for other programs. The Forestry Division has called on the planes to assist in locating outbreaks of the pine beetle. The Division of Wildlife Management uses the planes to track game tagged with radio collars, to locate and mark sea turtle nests and to make yearly counts of waterfowl. In recent years, the planes have been used to conduct surveys of bald eagle populations on Falls, Jordan and Shearon Harris lakes.

The Division of Boating and Inland Fisheries has found aircraft especially useful in spotting reckless boat operation. The Division also uses planes to determine the extent of fish kills and, occasionally, to find the source of the killing agent. Aircraft may also be called in on search-and-rescue missions, including drownings, lost hunters, felony manhunts and drug detection.

"I even got called in on a prison break near Clinton," says Adams. "I saw a car in the woods that wasn't supposed to be there and radioed in the ground units." A smile crosses his face as he pats the nose of his Super Cub. "Caught the man in about 15 minutes." ☐

KEN TAYLOR

DIEHARD *for* DOVES

So that opening day limit came easy, eh? Let's see how you do the rest of the season.

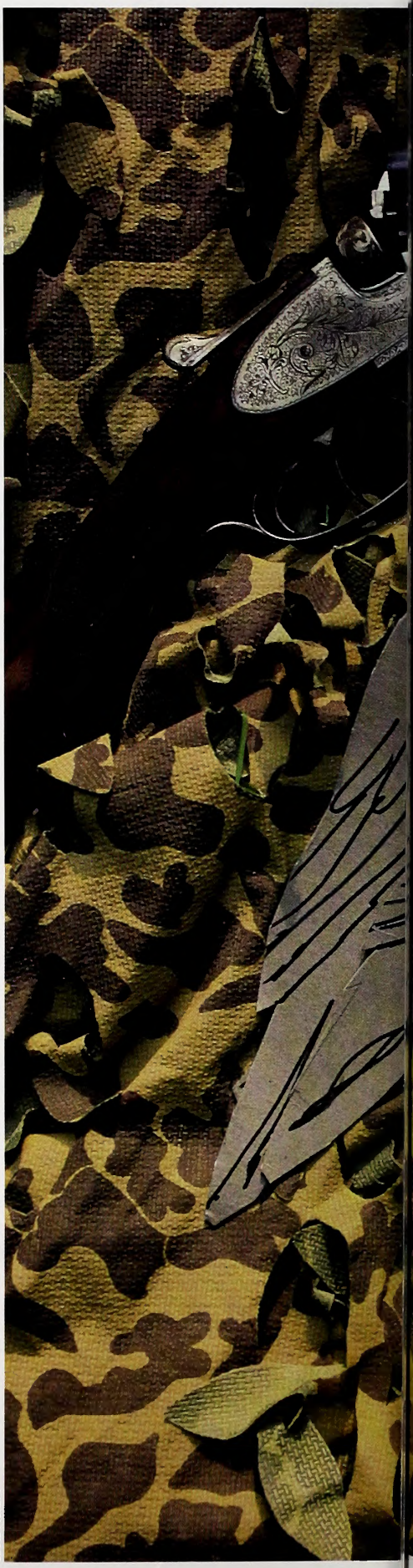
by Eddie Nickens ©1991

Everyone laughed the first year we planted our dove tree. Before dawn, with the pale light of a September sunrise seeping into the sky, Lee Davis and I dug a hole next to our blind and raised our banner, a 12-foot sapling stripped of foliage and hung heavy with dove decoys. We'd situated our blind on a field edge barren of any other trees or brush so the decorated sapling would be easily seen by any bird flying into the field. I'd read about the use of dove trees and figured that, if nothing else, such a gimmick would get us a few laughs, if not a few birds. I was right on both counts.

At first there were hoots up and down the dove field. *Unbelievable. Silliest thing I've ever seen.* Our opening day gunning partners stopped by to grill us with good-natured ribbing, but soon enough early flights of birds began streaming into the fields, met by gunfire crackling like popcorn. The guys with the dove tree were soon forgotten, or so we thought.

But the very next year, our opening day dove field looked like a roosting site. A half-dozen dove trees lined the 30-acre field, each with four or five full-bodied decoys perched on the bare limbs. Our silly idea was the next year's hot tactic. We didn't say a word. After all, imitation *is* the sincerest form of flattery.

As a rule, mourning dove hunters gun only once or twice a season, and are largely content to let the birds come to them. Often enough, doves do just that—especially during those frantic flights of opening day when most decent gunners can take a limit of birds even if they are standing in the



EDDIE NICKENS

***After the easy doves** of opening day disappear, hunters who use decoys, calls and camouflage will bring more doves to the bag than the casual gunner. Both full-bodied plastic decoys and home-made silhouettes are effective.*

Game Load
Faulks

KEN TAYLOR

***Small saplings or trees** laden with decoys are very effective in attracting doves into gun range. By late season, doves become wary and hunters must remain hidden to prevent spooking the birds.*

F. EUGENE HESTER

middle of the field wearing plaid golf pants. But *Zenaida macroura* is a quick learner. After the opening day guns subside, this feathered bullet takes off the dunce cap and graduates from the school of hard shot. By the last of the three-way split seasons in North Carolina, migrating doves are gun-shy and glare-wary. The birds veer away at the last moment, or circle the field and give wide berth to any blind. Late-season gunners scratch their heads and curse their luck, but I'm not so sure it's fate that leaves them empty-handed. I'm convinced that extra effort in planning a dove hunt will result in post-opening day game bags that look a lot like the take on the Saturday before Labor Day.

After our first positive experiences with the dove tree, I began wondering about other gonzo tactics for doves. Admittedly, our first dove tree was born as much out of one-upsmanship as necessity. But ever since then I've incorporated dove trees and ground decoys into nearly every dove hunt, from opening day through the December season, and I've discovered that fast-action dove hunting isn't limited to the first weekend in September. All it takes is a few special-order items, a willingness to experiment and an honest appraisal of hunting acumen. Tactics such as the use of silhouette decoys and a blind that would do a duck hunter proud can mean the difference between bacon-wrapped dove breasts hot from the grill or another trip through the drive-through.

But aggressive dove-hunting tactics won't mitigate poor hunting technique. Before you call in an order for a dozen dove decoys, review your behavior in last year's dove field. Most gunners simply walk to the nearest field edge and take a stand, then wonder why the other guys get all the shooting. Perhaps the other guys take the time to cover up the drink coolers and construct a blind. Perhaps the other guys go to the trouble of a reconnaissance mission, glassing the field the afternoon before to check out the flight lanes that lead the birds in and out of the field. Such routes change from year to year as farmers leave some fields fallow and bring others to the plow. In many cases, it's not *your* field that determines how the birds fly, but the farm fields in the surrounding area. Let other hunters rely on last year's sure-thing. Scout your field a day or two in advance.

Savvy gunners don't limit themselves to the traditional dove field, either. Biological requirements for doves are simple: the birds need feeding grounds, watering areas and roosting trees, and doves travel between established areas using flyways that can offer plenty of action. Sometimes those flyways are easy to find—birds often use power line cuts to ferry between feeding grounds and watering holes—while others can be in the strangest places. Some years ago we stumbled across a cleared Guilford County lot criss-crossed with dirt bike trails. Nearby, a new interstate was being cut, and hordes of doves seemed to use the interstate as both a navigational aid and as a source of the fine grit the birds need to digest food. For whatever reason, flights of singles, doubles and triples consistently flew straight across the field and over our pickup truck. Considering the amount of trash the lot held, we figured our vehicle looked like just another pile of garbage. Not exactly a wilderness experience, I'll grant you, but for an hour or two of shooting just after work, our trashpile flyway was hard to beat. The lesson here: whenever you see small groups of doves in the same area—cutting across a barren field corner, flying down a creekbed—take a few moments and watch. You may have stumbled across a pass-shooting paradise.

Taking time to study the flight patterns of a particular field can be crucial as well, especially after the Labor Day shoot when enough gunners aren't on hand to keep the birds moving. At times it simply takes enough patience to watch a field before you hunt it.

A few years ago we found a late-season dove field as exciting as any September site. The plump adult birds of December had found a cutover soybean field that straddled a rise above a small farm pond. Nearby power lines were sagging with birds when

Mourning Dove Population Nationwide is 475 Million

The plaintive coo that gives the mourning dove its name seems to fall on appreciative ears; mourning doves are champions of multiple broods, raising as many as four or five sets of young during the breeding season. Such high reproductive rates help offset high natural mortality rates. Although hunting mortality on the total dove population is just over 10 percent, overall mortality during the first year of life is well beyond 50 percent.

Nationwide, the mourning dove population at the beginning of the hunting season hovers around the 475 million mark, with an annual harvest of some 45 million birds. Harvest figures for North Carolina are taken every three years; in the 1986-87 season, 113,000 hunters took 567,000 dove-hunting trips for an annual harvest of approximately 2.6 million birds. In the 1989-90 North Carolina season, harvest figures had fallen to 1.9 million birds, taken by 100,000 hunters on 424,000 trips.

In the U.S. Fish and Wildlife Service's Eastern Management Unit, which includes those states east of the Mississippi River plus Louisiana, the 25-year trend shows a long-term, stable population of mourning doves. Central Management Unit figures are stable as well, but Western Management Unit numbers tell a different story. Falling populations there prompted tighter hunting restrictions during the late 1980s, with the results of those restrictions due soon. And recent cause for concern about the future of dove populations was found in North Carolina, where a 14 percent decrease between the 1989 and 1990 dove call count figures have biologists scratching their heads. Some biologists have expressed concern that fewer ducks and quail might mean greater pressure on doves. Already some large duck clubs across the country have begun managing fields for dove hunting, a practice receiving particular interest in the Southeast.

When you take to your favorite corn field this season, just remember that the bag limits are there for a reason. One bird over the bag is a game law violation, no less so than a deer gunned down in the glare of headlights. As sportsmen, we can't afford to think that "there are so many birds we could never shoot 'em out." That's been said before, and when was the last time *you* saw a passenger pigeon?

KEN TAYLOR

These homemade silhouette decoys *are easy to make and very effective. Place them in cutover grain fields or other feeding areas.*

we marched into the middle of the field, set up a blind, and got ready to burn out our gun barrels. A few hours later we could boast of a few shots, but nothing like the action we expected. By the time we figured out the flight pattern the doves were using to enter the field, it was almost too late to move our blind. On the hillside beyond the pond, the doves were feeding in a field, then flying to rest on the wires that ran behind our initial blind. By positioning ourselves just under the rise, we could ambush the birds at point-blank range. We had a few minutes of hot shooting before the sun melted under the horizon. Had we watched the field for a half-hour before rushing to build the blind, we'd have walked away with a limit of birds instead of a lesson learned the hard way.

Admittedly, these notions seem like little more than common sense, but it's not uncommon for hunters to give precious little thought—and spend precious little energy—to such matters. Fewer still treat the precious bird of peace like the savvy wildfowl it becomes after dodging a few barrelfuls of eight shot. I'm sure some hunters would feel silly about setting up silhouette decoys, or building a blind on the edge of a dove field, not to mention calling the birds with a commercial dove call. But those hunters haven't hunted the wily birds of winter. Aggressive tactics are needed for birds that have survived the opening day gauntlet.

After being shot at from Canada to the Carolina line, surviving birds know a hunter when they see one, whether he's hiding behind a spindly cornstalk or not. I make it a point that they don't see me. Camouflage netting is cheap, durable and indispensable. I buy the lightweight cloth version, with a green pattern on one side and brown on the other. A 30-foot section is perfect; cut the material in half, then halve one side again. That leaves you with one 15-foot section for blind construction and two smaller pieces to use as one-man covers.

In front of my blind I scatter a dozen to 18

ground decoys—homemade silhouettes or full-body plastic blocks. Do they work? Without a doubt. Are they necessary? It all depends on how serious you are about shooting a dove, and how serious the dove is about not getting shot. The way I figure it, it's best to advertise your wares, but stay hidden behind the checkout counter.

Silhouettes are easy to make. You'll need four sheets of gray poster board—with two glued together, there's enough paper for a dozen and a half decoys, plus a handful of wings. Use a regular decoy for an outline, then cut out the silhouettes, draw on a black bill and eyes and sketch the outline of a few wing feathers. I cut a slit in the body of a few birds and insert a wing silhouette to give the spread a three-dimensional appeal. Staple on a popsickle stick for ground support and have at it. One word of caution, however: Twenty minutes of rain and these low-budget dove decoys will wilt away. This year I tried to find thin sheets of gray plastic to use for dove bodies, but without success. If you have a more durable material handy, by all means, use it.

And don't forget the dove tree. Getting your blocks off the ground makes them more visible. We've always placed our tree beside the dove blind, but this year we're going to move the decoys out into the field in front of the blind, or to the side. If a dove tree works, I figure, it works because it draws the birds' attention. It's probably best to have that attention centered away from a swinging gun barrel.

Hunters shouldn't expect dove trees, silhouette decoys and a well-constructed blind to bring coo-birds belly-up behind the gun bead. Doves aren't ducks, and these tactics aren't designed to decoy the birds into your spread. What these practices do is draw the birds into your shooting lanes—the rest is up to you.

These tactics are the most valuable, perhaps, when gunning for doves solo after the opening-day hordes have vacated the field. That's when my friend Dixon Herman swears by a dove call. In the middle of the day, when birds are loafing in the trees by the field edge, Herman blows a mournful whistle through cupped hands. Keep it up, he says, "and invariably two or three birds will start to cruise the field." Commercial dove calls are available for just such a purpose, such as the Faulk's D-8 dove call.

Outdoor writer George Reiger tells of going one better. He uses ground decoys early in the season, when courting may still be on the minds of resident doves. Setting up decoys in trios, with two birds facing each other and another off to one side, Reiger coos on a dove call. He swears unpaired singles fall for such a gimmick, and he writes that it results in his less die-hard hunting friends complaining that he has all the luck.

Maybe so. But after opening day, luck is where you make it. That's what I'm telling my neighbors if they wander over to the fence and wonder why I'm hiding in the bushes, practicing a lustful coo to the doves that water in the front-yard creek. I'll have that call down pat by opening day. You see, like my feathered friend the mourning dove, I'll fall for any gimmick, at least once. ⊠

F. EUGENE HESTER

***Many hunters** don't take mourning doves seriously enough to consistently bag them in late winter. Being dedicated enough to scout an area for dove concentrations will increase your success.*

TEDs May Save Turtles

Juvenile, Adult Sea Turtles Important to Populations

Written and Edited by Vic Venters

If endangered sea turtle species are to be saved from eventual extinction, preservation efforts are going to have to go beyond saving turtle nests and protecting eggs and hatchlings. That's the word from Dr. Larry Crowder, a zoology professor at N.C. State University who has studied 20 years of loggerhead sea turtle data. His research shows that in order to effectively reverse the declines, more large juvenile and young adult turtles are going to have to be saved, probably by the continued use of the controversial turtle excluder devices (TEDs) on shrimp trawler nets.

Crowder developed a mathematical population model of loggerhead turtles. The model showed that the large juvenile and young adult turtles that are often drowned in trawling nets comprise the most critical groups determining the success of sea turtle population recovery. The research analyzed the reproductive value of turtles at different ages. Because a sea turtle lays thousands of eggs in her lifetime and because most hatchlings will succumb in their first years to predators, the value of individual turtle eggs to long-term restoration of sea turtle populations is very low.

On the other hand, the value of a large juvenile is six time that of an egg. A mature breeder's reproductive value is more than 500 times the value of an egg. Using those values, Crowder determined that because the reproductive value of the earlier egg stage is so low compared to the older stages, protecting even 100 percent of the eggs and hatchlings will not reverse declines in the numbers of nesting females.

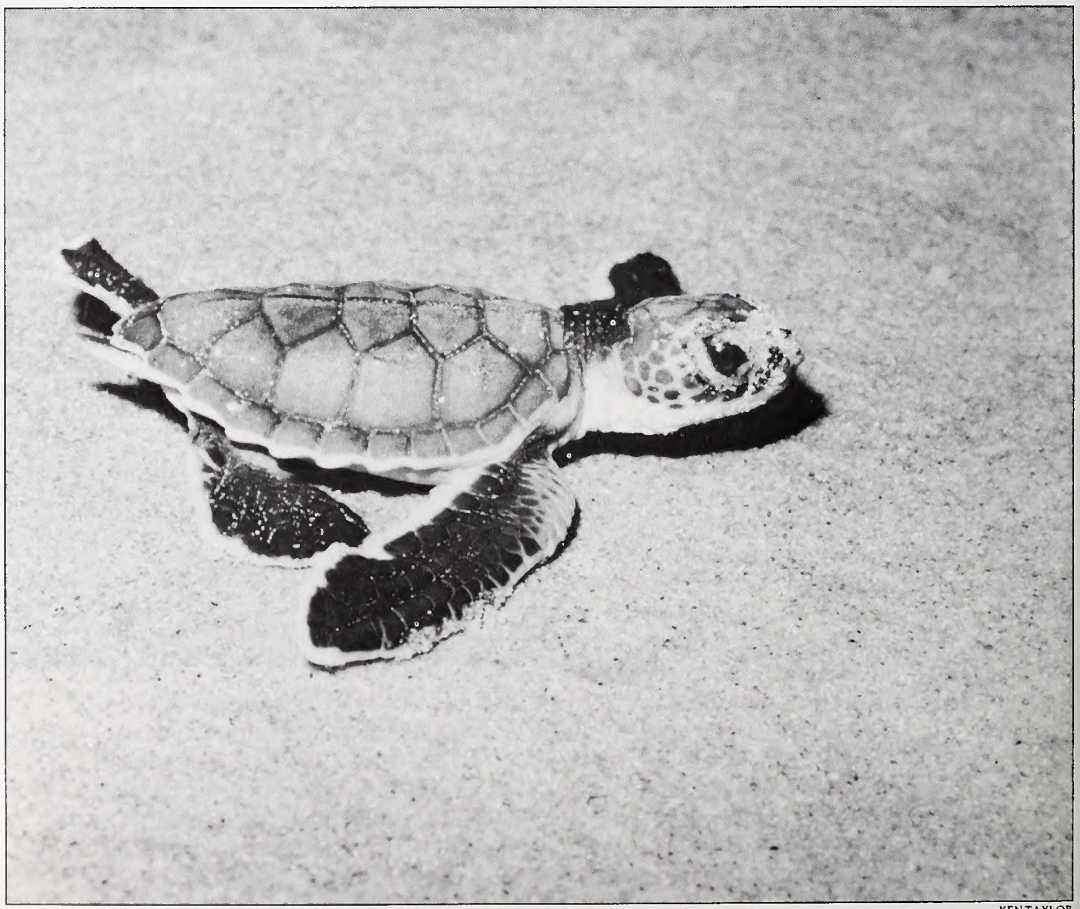
"What came as a shock is that beach-oriented protection programs alone will not protect the loggerhead," Crowder said. "We found the stage we need to target is the large juvenile. We found that a 15-to-20 percent increase in survival of the large juveniles would allow the population to recover."

Crowder is using his population model to help marine fisheries officials determine the effectiveness of the TEDs now required on most shrimp trawlers. TEDs are essentially trap-doors that allow turtles to escape trawling nets and avoid drowning. A National Academy of Sciences report published last fall concluded that trawling is the single largest cause of sea turtle deaths—an estimated 40,000 to 50,000 per year in U.S. waters alone. TEDs have not been popular with trawlers, especially in the Gulf Coast states because, commercial fishermen argue, the equipment reduces their catch.

Crowder said his continuing research on turtle populations will provide analysis to show whether TED use will improve turtle populations. Early data indicates that TEDs and other measures to protect large juveniles and adults may be critical to marine turtle species.

"Beach-oriented turtle conservation plans are fine, but they are not enough," Crowder said. "There's promising evidence that TEDs will have very positive effects on the population, but it will take time because turtles are long-lived. My message is hang in there, but don't expect to see big results right away."

—Debbie Griffith
N.C. State University Information Services



KEN TAYLOR

Turtle Trouble: *Although efforts to save sea turtle nests and hatchlings like this young loggerhead are vital, they will not alone reverse serious declines in sea turtle populations, reports a scientist at North Carolina State University. Continued use of turtle excluder devices on commercial trawlers will remain necessary, his research shows.*

Rewarded for Heroism

Commission Enforcement Officer Makes Brave Rescue

Thanks to the bravery of a Wildlife Resources Commission enforcement officer, James King of Rockingham was saved from certain drowning last September. Officer Mike Loukos of District 6 rescued King from the Pee Dee River below the Blewett Falls Lake Dam. For his rescue efforts, Loukos was recently presented the 1991 Southern State Boating Law Administrator's Association award.

On Sept. 14 last year, Anson County emergency personnel asked Loukos to assist in rescuing King, a bowhunter who had entered the river to retrieve his boat that had floated away from its mooring. King had been swept away by the swift current, which had swollen over the river banks and was running at speeds estimated to be 25 miles per hour.

By the time Loukos arrived, it was dark and King had been in the water for about two hours. King was clinging tenuously to a submerged snag and the current was flowing over him. He could breathe only when he would pop to the surface before being submerged again. He was tiring rapidly.

Loukos couldn't see King but could hear his cries for help. King told Loukos he couldn't hold on much longer. When Loukos learned the rescue boat would not be there for some time, the enforcement officer made a brave decision. Loukos removed all his leather gear and equipment, donned a life jacket and grabbed the spare tire from his vehicle. He wrapped rope around the tire so that he and King could grab it. He entered the water upstream of the location where he thought King might be. In the dark, it took Loukos about 30 minutes to find King.

"When I located him, I had to align myself above him so that I would be swept right past him," Loukos explained. "The current was moving so fast that if I didn't get him on the first pass, I'd go right on by. There probably wouldn't be a second chance."

Luckily, Loukos managed to grab King as he swept past. "He was in shock and about to give up," Loukos explained. "I held onto him and we drifted down the river." Both men were too tired to swim to shore and drifted with the current until the rescue boat picked them up.

KEN TAYLOR

Bravery Rewarded: *Wildlife Enforcement Officer Mike Loukos accepts the 1991 award from the Southern States Boating Law Administrator's Association for his rescue of a hunter from the Pee Dee River last September.*

Developers Donate Tract

Wetlands Added to Cedar Island Wildlife Refuge

About 2,000 acres of wetlands and maritime forest have been added to the Cedar Island National Wildlife Refuge in eastern North Carolina.

The land, valued at about $1.5 million, was donated last December to the U.S. Fish and Wildlife Service by the Bay Land Corporation, a group of Fayetteville-based land developers.

Approximately 1,500 acres of the 1,956-acre tract are irregularly flooded marshland and comprise about 8.5 miles of estuarine shoreline. According to Fish and Wildlife Service data, the marsh is used by a variety of wading birds, as well as by wintering waterfowl. The marsh also provides nesting habitat for such uncommon species as the black rail and wintering areas for bald eagles and peregrine falcons.

The remaining acreage contains maritime forest, swamp forests and pocosin habitat. The marsh is also traversed by ancient beach ridges that support longleaf pine/wiregrass communities, excellent habitat for the endangered red-cockaded woodpecker.

The Cedar Island refuge and marsh area is one of the best remaining unaltered or slightly altered estuarine habitats in the state, said Don Temple, manager of the Cedar Island National Wildlife Refuge. "We were glad to get it," he said. "Its acquisition protects an unfragmented and fairly undisturbed marsh and coastal uplands area, and helps buffer the effects of human influences on Cedar Island Refuge."

Originally purchased by Bay Land investors in the 1960s, a golf course/marina complex had been planned for the site. With the donation, the investors at Bay Land got a tax break, but more than money was involved in the decision to donate the parcel. "Environmental regulations would have made real estate development difficult," said Temple, "but the people at Bay Land had a genuine concern for this property."

"This was a decision we feel very good about," added Joe Thompson, president of Bay Land Corporation. "Our board voted unanimously for the donation. It was a very fragile environmental area and we're thrilled to see this land preserved."

Hunting Keeps Improving

Ruffed Grouse Populations Up in Mountains

Through last season, ruffed grouse populations continued to climb in North Carolina's mountain counties. As measured by the Avid Grouse Hunter Survey, both flush rates and harvest rates increased last year over the 1989-90 season. Hunting parties flushed one grouse for each 45 minutes hunted.

Flushing a grouse, however, doesn't necessarily mean that the hunter will be able to shoot it, as it took an average of 5 hours and 15 minutes per party to bring a grouse to the bag. Still, this was an improvement over the previous season's average of one bird per 6 hours and 15 minutes.

The Avid Grouse Hunter Survey is a composite of results from over 80 avid grouse hunters from 1,250 hunts. Results were reported from 22 mountain counties.

The trend of flush rates has gone upward since the study was initiated in 1984. Last year's average was 30 percent above rates reported during the first year of the survey. The average harvest per season per party has also increased from about 11.7 birds in 1984-85 season to about 14.4 birds in the 1989-90 season. Increases have been greatest in the northern mountain counties.

LEONARD LEE RUE

Grousing Around: *According to flushing and harvest rates, ruffed grouse populations continue to climb in North Carolina's mountain counties.*

Help Needed For Big Sweep

Volunteers are needed for Big Sweep '91, the award-winning annual statewide beach, river, stream and lake cleanup. This year, Big Sweep will be held Saturday, Sept. 21. Thousands of volunteers from around the state will participate in their local area in the cleanup efforts. In past years, tons of trash have been removed from beaches and waterways during the clean-up operation.

Litter in our waterways can be harmful to both people and wildlife. Each year, thousands of birds, mammals and fish eat or become entangled in debris and die. If you'd like to volunteer to be a trash collector, call the Big Sweep MCI hotline at 1-800-27-SWEEP. Operators will be able to direct you to cleanup sites in your region. For more information about Big Sweep, you can also contact the Raleigh headquarters office at (919) 737-2454.

Set for Sept. 28

20th National Hunting & Fishing Day Celebrated

During this last decade of the 20th century, storm clouds continue to grow over the sport of hunting. The anti-hunting movement is mushrooming in popularity, while the pool of hunters is slowly shrinking as our nation becomes increasingly urbanized and distanced from the rural countryside. With even worse long-term implications, the loss of wildlife habitat continues at a rapid pace as urban sprawl and other habitat destruction continue to replace forests and wetlands across the nation. And each year, without fail, the sport of hunting gets a black eye with the non-hunting public as game law violations like poaching and baiting remain pervasive.

With this in mind, concerned sportsmen should pay extra attention this year to the 20th anniversary of National Hunting and Fishing Day that will be celebrated Sept. 28. The event recognizes the $12 billion sportsmen have contributed to scientific wildlife conservation through license fees, duck stamp purchases and excise taxes on sporting equipment. Despite heated rhetoric from anti-hunting groups, no other wildlife constituency group comes even close to this record of stewardship.

Check your local papers or local wildlife clubs for events scheduled around the state. As public scrutiny of the sport increases, the need for safe hunting and a responsible image becomes more than important —it's crucial to the sport's survival. Game laws are in place because they are needed. Obey them and report violators. If you're not already a member, you might also consider joining one or more of the conservation groups dedicated to preserving wildlife habitat on the local, state or national level. Without protected habitat, there will be no wildlife—or hunting.

Some fishermen may think they are immune to these pressures, but increased attacks on angling are not far behind. One animal rights group has already denounced fishing—even catch-and-release fishing—as cruel.

For more information on how to protect your sport and wildlife conservation by participating in the 20th anniversary of National Hunting and Fishing Day, write National Hunting & Fishing Day, 555 Danbury Road, Wilton, CT 06897.

Must have been some game animals playing here.

Proceeds Go to Parks

Poster Celebrates State Parks

NC WILDLIFE RESOURCES COMMISSION

Poster for Parks: *To commemorate the 75th anniversary of the North Carolina parks system, the Eno Association has developed a special poster featuring James Valentine's photography to benefit the state parks. All profits from the sale of posters will go to the state parks system. The price per poster is $5 with a $1.75 shipping charge. Send your check or money order to State Parks Diamond Anniversary Poster, N.C. Division of Parks and Recreation, 512 N. Salisbury St., Raleigh, NC 27604-1148. Make checks payable to N.C. Division of Parks and Recreation.*

STOP Wildlife Violations!
Report Violators
1-800-662-7137

Calendar

On several occasions, events in this calendar have been changed or canceled without notice. Readers should check with the contact listed before traveling to an event.

Sept. 6-8

North Carolina Wildlife and Sportsman's Show in New Bern will feature guns and sporting equipment, custom knife-makers, artists and art exhibits, dog trainers and more. For more information, contact the New Bern Area Chamber of Commerce, P.O. Drawer C, New Bern, NC 28563, or call (919) 637-3111.

Sept. 14-15

10th Annual Currituck Wildlife Festival sponsored by the Currituck Wildlife Guild. Features wildlife art, woodcarvings, decoys and a photography show and sale. Proceeds go to the proposed wildlife museum in Currituck County. For more information, contact Currituck Wildlife Guild, P.O. Box 91, Shawboro, N.C. 27973.

The 1992 North Carolina Wildlife Calendar Is Here!

With such artwork as Janet Allen Walker's "Return to the Wild—Red Wolves" (featured on the inside back cover), the North Carolina Wildlife Calendar is sure to sell out again this year.

The works of Robert C. Flowers, Jr., Janet Allen Walker, David E. Doss, Patsy McAuley, Bob Henley, Bob Herr, Duane Raver, Larry Barton, Walt Obman, James A. Brooks, Joe Seme, and Bob Timberlake are featured in the 1992 Wildlife Calendar. Order yours today by returning the form below with your check or money order to 1992 Calendar, N.C. Wildlife Resources Commission, 512 N. Salisbury Street, Raleigh, NC 27604-1188.

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CALO92

Mowing Millet, Planting Clover and Cleaning House

by Vic Venters

Ah, cooler weather. Opening Day for doves. Fall fishing at the coast. There are a few items to take care of, though.

Lucky Clover: Clover is one of the most beneficial wildlife foods that you can plant in September. It's a great green winter forage for deer and turkey, and everyone knows that rabbits love it, too. Clover also attracts plenty of insects so it will make excellent turkey poult foraging ground next summer. Throughout September you may plant ladino clover, a perennial variety, in the Coastal Plain. In the Piedmont, planting can be done through mid-September. Before you rev up the tractor, however, you should get a soil test. Clover can be finicky to grow and does not prosper in either acidic or dry sandy soil, unless the land has been limed or properly fertilized. You'll also want to decide whether you want to plant a perennial or annual variety of clover. To get the best clover crop be sure to follow fertilization and preparation instructions. For more information, call the Division of Wildlife Management at (919) 733-7291.

Bird Housecleaning: With winter just around the corner, September is a good month to inspect and clean bird houses you may have put up earlier in the year. After spring and summer, chances are your bird house may have accumulated nesting debris. Birds are prone to parasites and houses sometimes attract colonies of stinging insects like paper wasps and mud daubers. It's good to clean nest boxes to remove these insects, parasites, egg shells or dead nestlings. If possible, take down the nesting box and clean it with hot water and a brush. Removing the debris minimizes parasites, and clean nest boxes have a better chance of being occupied next spring. Breeding success may also be improved.

Dove Fields: If you're planning on hunting dove fields this month, you'll probably want to mow down the food strips of millet you've planted. In keeping with federal baiting laws, however, you cannot scatter additional seed on top of planted fields or gather the crop to concentrate or disperse again. To keep doves in your fields, don't hunt more than once a week. Biologists also recommend that you don't hunt the fields late in the afternoon.

THE 1992 NORTH CAROLINA WILDLIFE CALENDAR IS HERE!

"Return to the Wild—Red Wolves"
Janet Allen Walker

1992
February

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday

Janet Allen Walker's painting of "Return to the Wild—Red Wolves" is just a sample of the fine art featured in the 1992 North Carolina Wildlife Calendar. To order your calendar, see *Back of the Book* section pgs. 29-31.

September Songster

No late summer day is complete without the lazy cooing of a mourning dove, but sportsmen are not fooled. Few birds can match its swift, erratic flight.

Second-class postage paid at Raleigh, North Carolina

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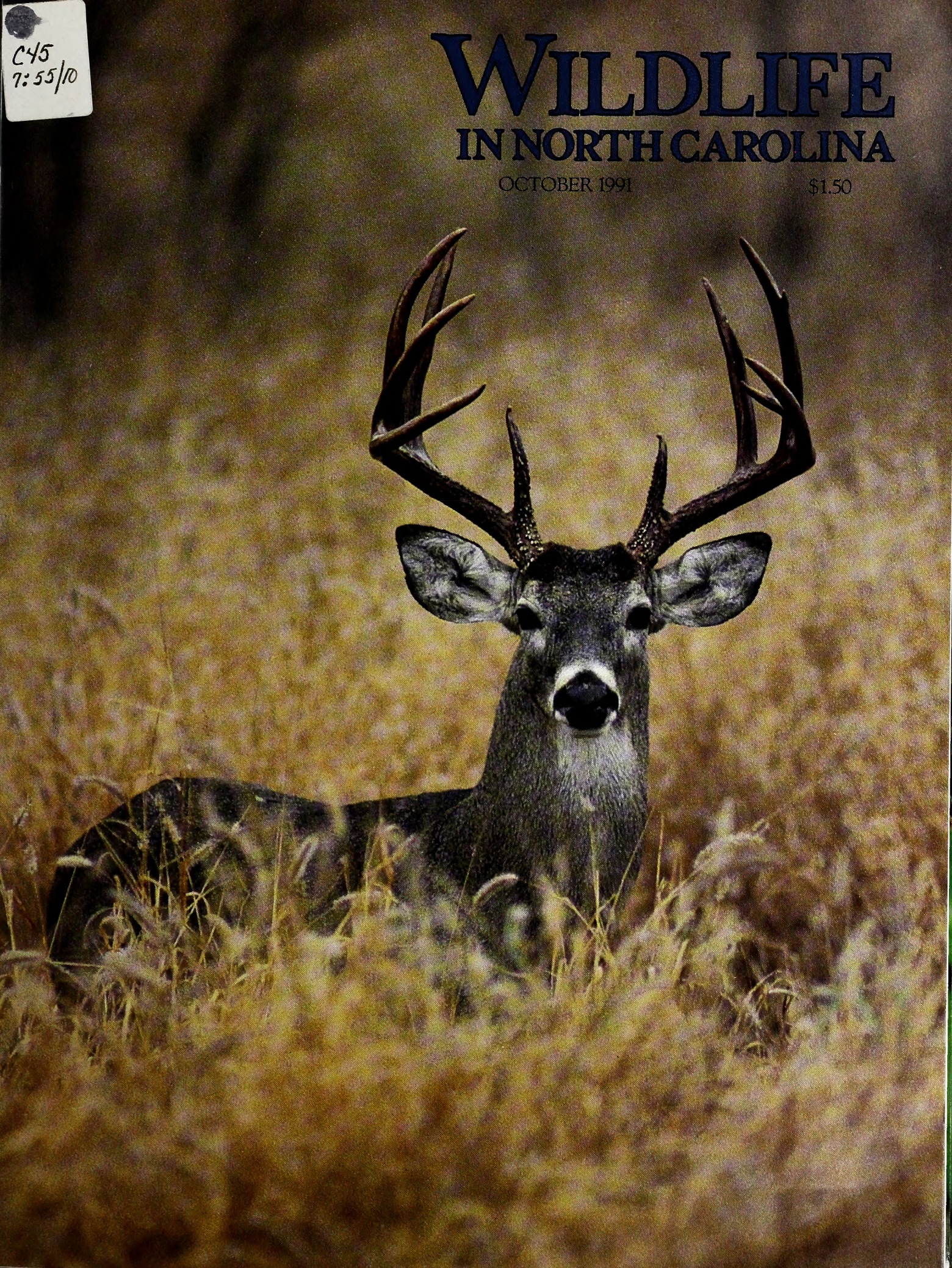
WILDLIFE IN NORTH CAROLINA

OCTOBER 1991 $1.50

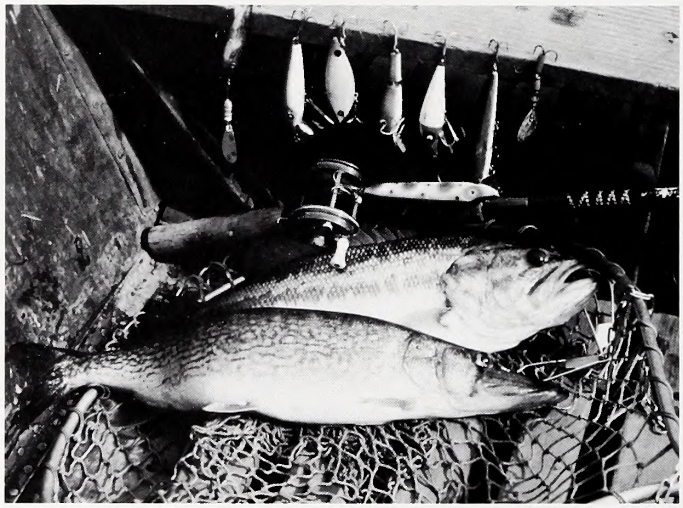


Fishing and Supply-Side Economics

by Jim Dean

Is it just me, or does this sound familiar? One day this past summer, I needed to stock up on some lures and other tackle. I'd used up all my favorite colors of plastic worms and lizards, and a bass had run off with my favorite silver-finish topwater plug. My two best crawfish-colored crankbaits had found permanent homes in submerged stumps, and my last black muskie Jitterbug had inexplicably nested in the top of a 40-foot pine on a moonless night. I also wanted a particular brand of monofilament, a couple of dozen ½-ounce reservoir worm weights, and some new skirts for my spinnerbaits.

I couldn't find a single one of those items in the almost identical tackle sections of four large chain stores, and my two favorite independent tackle shops had both recently gone out of business. I wasn't surprised. In recent years, it seems to be increasingly difficult for serious fishermen to purchase tackle. The large chain stores often don't carry what you need, and they've priced what they do manage to carry low enough to force many of the smaller independent shops out of business. Fishermen are the losers, of course, and it's at least partly our fault.



JIM DEAN

"I had to stop carrying fishing tackle," one local store owner told me. "I can't compete with the large chain stores. They're able to buy in volume and undercut my prices. The only way I might compete is to provide high quality gear and specialty items and accessories that serious fisherman can't find in the chain stores. But I can't afford to buy and keep all that stock. Too many fishermen buy their lead weights and worms from me, but go to the big chain stores to beat my prices on big-ticket items like reels."

It's certainly true that you can often find better prices at major chain stores, but with few exceptions, the selection is limited and largely geared toward mid-range quality. Stocks are poorly planned, and even more poorly maintained. Furthermore, when it comes to fishing knowledge, most clerks haven't got a clue, and even if they do, they have little control over what's in stock.

"Sorry, but we won't be reordering fishing tackle until early next spring," chain store clerks have told me on several occasions.

Typically, after April or May, plastic worm and lure selections have been picked over. On the other hand, if you want four dozen ultra-light bubble-gum crankbaits, they've got 'em. The problem doesn't end with lures. Popular brands and sizes of line are likely to be long gone. That bristling rod rack is inviting until you take a closer look and find it contains dozens of nearly identical rods with little or no variety in length and action. Specialty items and accessories for serious fishermen are seldom stocked. True, it isn't always so bleak in every store, but the situation I've described is fairly typical.

In most large chain stores, the orders for every store are apparently placed only once each winter by some national, bottom-line buyer in the distant home office who has little or no idea what anglers truly might need or want at local outlets across the nation. Thus, with few exceptions, a store in Michigan is likely to have virtually the same limited, identical stock as a store in North Carolina or Florida.

Another closely linked trend is the rise in large retail mail-order tackle suppliers. Fly fishermen and, to a lesser extent, salt-water fishermen have always depended heavily on catalogs. Now, more and more serious bass, walleye and pan-fishermen are also forced to buy by mail from Bass Pro Shops, Cabela's and others. Yet while catalogs offer good prices, quick service and better selections, they also pose a threat to local independent shops.

It's ironic. You'd think a rapidly growing multi-billion dollar sportfishing industry would result in greater availability of fine tackle on the local level, but that's not the case. Furthermore, manufacturers seem to be content with the present trend and may even be encouraging it.

Of course, there are still quite a few independent tackle shops in business, especially in smaller cities and towns. Some have wonderfully complete stocks. Some don't. But if we want them to stick around, we'd better support them even if it means paying a bit more for some items.

It would be a real pity if someday there were no local tackle shops. We'd miss the clutter, the snapshots of catches, the friendly banter with old friends and tips passed on by clerks. Who's going to tell you what's biting and where? And what's it worth to actually see, compare and test the tackle you're thinking of buying?

Besides, how many chain stores or mail-order houses will dip you a tub of crickets or a bucket of minnows, then wish you luck and mean it?

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WILDLIFE IN NORTH CAROLINA

Wildlife in North Carolina is the official educational publication of the North Carolina Wildlife Resources Commission and is dedicated to the sound conservation of the State's wildlife and other interrelated natural resources.

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Cover *A large white-tailed buck rests in a field, but it still keeps a wary eye out for danger. Photograph by William S. Lea.*

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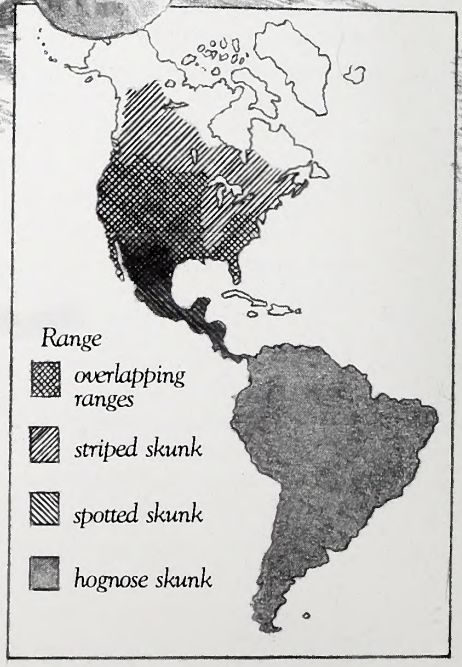
The boldly marked striped skunk *rummages through a nest of turtle eggs. Skunks are omnivores and generally nocturnal, spending most daylight hours holed up in their burrows. Depending on the season, they may eat voles, insects (especially grasshoppers, crickets and beetles), birds' eggs and berries.*

Bold white markings *of the striped skunk (top) differ from the white splotches of the spotted skunk. Actually, skunk markings can vary. The white splotches of the spotted skunk grow narrower the farther north you go.*



Immature bobcat (right) learns a lesson in this encounter with a striped skunk.

***The smallest of North Carolina's skunks,** the spotted skunk, is also the most aggressive. Sometimes it rises on its front feet when approached, a posture that displays its markings and allows a predator to back away quickly.*

Nature's Stop Sign

written by Lawrence S. Earley / illustrated by David Williams

It won't exactly knock you down or bully you, but it's no pushover, either. It swaggers about the woods as if it hadn't a care in the world, or had a secret weapon. Which, in a way, it does, although among other animals it's hardly a secret. Indeed everything about the skunk announces, "Don't mess with me!"

Mostly it says it through its markings. Most mammals are color-blind and thus are inconspicuously marked, their coloring generally buff, gray or brown and usually broken up by shades of white. Not so the skunk. Its colors are a bold black and white—alternating black and white stripes, in the case of the striped skunk, and broken black and white stripes in the case of the spotted skunk.

But the skunk also gets its warning message across through its behavior. Indeed, it's not the shy, retiring sort at all. It doesn't skulk about, hiding from predators; it doesn't freeze when approached, hoping to blend into its surroundings; and it doesn't confine itself to nocturnal or crepuscular times of day (twilight or early morning), although it does move about at those times. No, the skunk goes boldly forth at any time, in full daylight as well as night. And when approached by a predator, skunks' behavioral adaptations are quite remarkable, although our two skunks follow slightly different scripts. The striped skunk will arch its wide tail over its back and stamp its feet. The spotted skunk does a handstand, raising its body vertically as if to show off its boldly striped back.

If the predator ignores all these warnings—because it's young, hungry or just plain foolish—the skunk lets him have it. What this means, as everyone knows, is that the skunk will spray the animal with a stinky scent that is so offensive that the predator inevitably turns tail.

Skunks do this with scent glands located on either side of the anus. These glands are common in most mammals, well developed in the mustelid family (weasels, otters, skunks and badgers), and best developed among the skunks. The scent or musk contains sulfuric acid, so it is particularly noxious. For humans unlucky enough to be sprayed with this substance, it may take a month for the odor to disappear from clothes.

And don't think you can mess with the young ones and go unscathed. At the early age of 28 days, little striped skunks are ready to spray. They are born from May to early June, in underground burrows. In two months they are hunting with their mothers, and by August and September they've cut the apron strings for good. Striped skunks breed once a year between February and March.

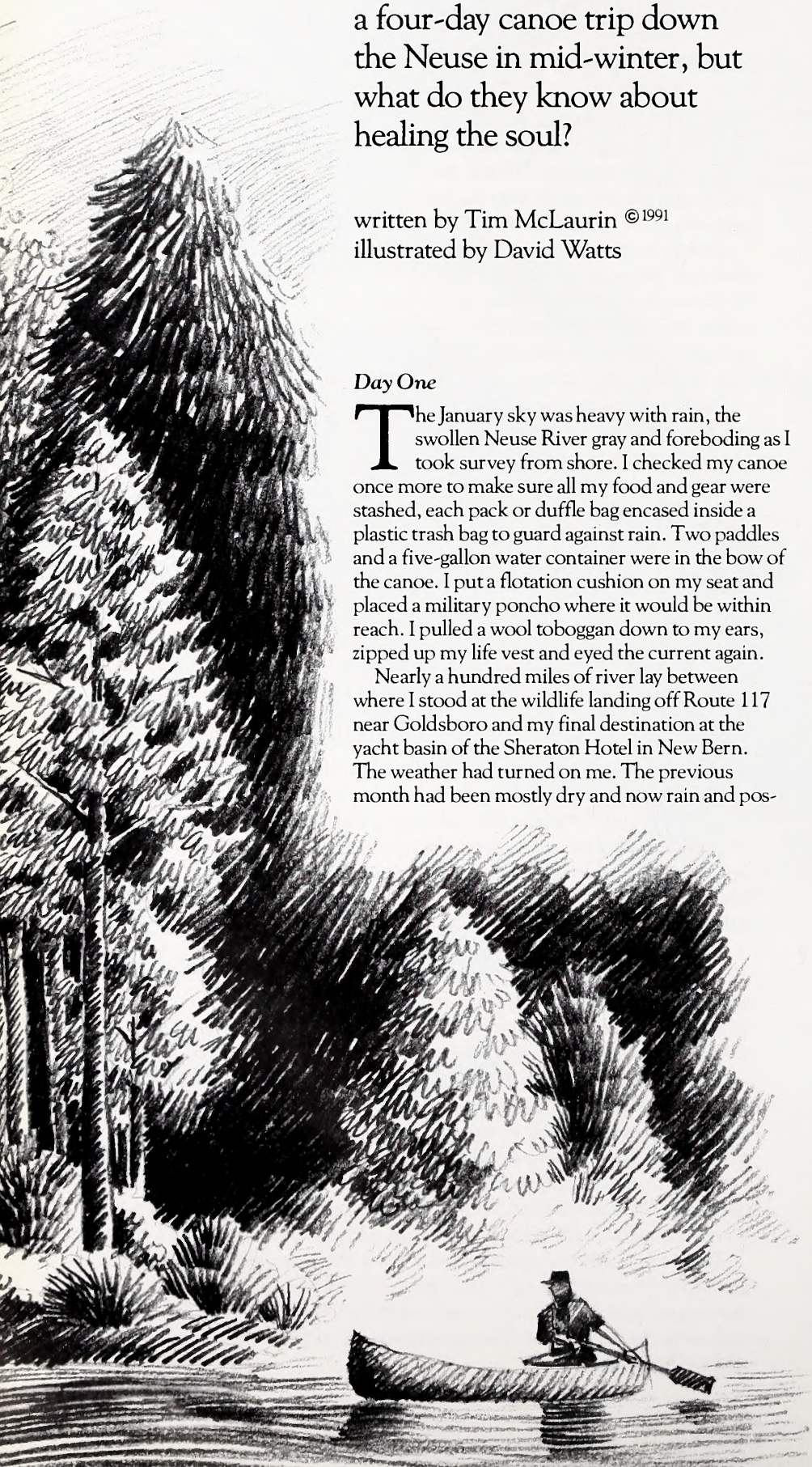
Spotted skunks have similar life histories, although their behavior is slightly different. Unlike striped skunks, spotted skunks climb trees, finding a den or a resting station above ground. While striped skunks are not true hibernators, they slow their activities in winter and may become dormant, seeking safety in an underground burrow. Spotted skunks are active throughout the winter.

There are only a few species of skunks in the world, in three genera located in North and South America. Of North Carolina's two species, the striped skunk is found throughout the state, with its populations highest in the mountains. The spotted skunk inhabits the mountains and western piedmont.

LONG RIDE HOME

The doctors didn't prescribe a four-day canoe trip down the Neuse in mid-winter, but what do they know about healing the soul?

written by Tim McLaurin ©1991
illustrated by David Watts



Day One

The January sky was heavy with rain, the swollen Neuse River gray and foreboding as I took survey from shore. I checked my canoe once more to make sure all my food and gear were stashed, each pack or duffle bag encased inside a plastic trash bag to guard against rain. Two paddles and a five-gallon water container were in the bow of the canoe. I put a flotation cushion on my seat and placed a military poncho where it would be within reach. I pulled a wool toboggan down to my ears, zipped up my life vest and eyed the current again.

Nearly a hundred miles of river lay between where I stood at the wildlife landing off Route 117 near Goldsboro and my final destination at the yacht basin of the Sheraton Hotel in New Bern. The weather had turned on me. The previous month had been mostly dry and now rain and possibly sleet was forecast for the next three days. I had made up my mind the night before I was going anyway. I promised myself this trip while hooked to machines in the Veteran's hospital in Seattle where I was undergoing a bone marrow transplant for multiple myeloma, a rare disease of the white blood cells. Besides, a man who always waits on good weather misses a lot in life. I pushed the canoe into the river until only the stern was aground. I got in and by bucking forward and shoving with my paddle, slid into deep water.

Aided by the current and a few minutes of strong paddling, I was soon under the 117 bridge and beyond the grind of traffic. The canoe tracked well. Most of my gear was stored up front, so the bow rode low and cut the water like a blade. She was a 16-foot Grumman, old and beat-up a little, but she had carried me many a mile on North Carolina rivers and lakes. I set into a rhythm of two strokes—switch sides—two strokes, and trained my eye on the inside bend up ahead. The river was only about 100 feet wide this far inland and after another couple of minutes I was around the curve and out of sound and sight of the bridge and cars. The sky still threatened rain at any second, but for the moment I was dry and I resolved to paddle as hard as possible for the duration of the day. I had formed a picture in my mind's eye of how that yacht basin would look four days from now when I swung right just beyond the highway 17 bridge, where I would tie up beside those big boats, get me a room, take a bath and lay up and drink some beer and order a steak from room service. Not enough rain could fall to drown that vision.

I was not a rookie at canoeing or winter camping. For several years I had taken a post-Christmas adventure. One year I canoed the Cape Fear from Fayetteville to Wilmington. Other years I had gone for the more exotic. One New Year's I spent backpacking in the desert mountains of Big Bend National Park in Texas. Another year, a friend and I canoed 110 miles through the Everglades, aided only by map and compass. I was also a veteran of the Marine Corps, and served as a Peace Corps volunteer in Tunisia. My camping gear had been collected over the years, was tested and well broken in. This trip in comparison to some should be easy—a straight shot down river to where the rain water would mingle with the sea. My muscles only had to hold out. They had been pretty idle for the past eight months.

I hadn't long left behind the roar of traffic when I first began to hear jets. The Neuse passes right beside one of the runways at Seymour Johnson Air Force base—so close you can see approach lights mounted on pilings in the river—and a lot of planes were in the air. I thought about how only a week was left before the UN's deadline for Saddam to pull out of Kuwait, and many squadrons were already in Saudi Arabia, gearing up for action. I pulled hard at the river, wanting to leave behind all traces of men and machines and threats of war.

Noon had passed; I eyed the banks for a possible stopping site for lunch. The shore was muddy and I

opted to eat on the go. In a small rucksack behind my seat, I had stashed my lunch—crackers and a can of Spam—none of that yuppie freeze dried stuff, but the food I was raised on. I opened the can and sliced the meat into layers with a skinning knife left to me by my father. The salty meat and crackers were washed down with Kool-Aid mixed in a canteen. Between bites, I occasionally rowed to one side or the other to keep the canoe lined up with the current in mid-river. The rain began after I had been paddling a couple of hours, first a drizzle I tried to ignore, then big drops I knew would soak through my coat. I pulled the poncho over my head and cinched the hood snugly under my chin. I was like a duck now. Let it rain.

It did—hard—for about two hours. At times I couldn't see more than 50 yards down river. But the water rolled off me, and I kept warm and dry. My only problem was the rain collecting in the canoe, but since it flowed back to me, all I had to do was bail occasionally. The flat-sided Spam can worked well to scoop up the water. I kept tracking.

The rain actually aided in some close encounters with wildlife. The patter of rain drowned out the sound of my paddle, and several times flocks of duck swooped in almost on top of me before spotting me and flinging themselves cloudward. I watched an eight-point buck and several does drink from the river, floating even with them before the buck sighted me, wheeled and fled. I finally sighted a sign beside the river that announced I was entering Cliffs of the Neuse State Park. My watch read a quarter to five, and I knew it was time to start looking for a camping site before the banks began to get steep and darkness fell. Maybe pure chance, maybe divine intervention, but just ahead I spied a sandbar shaded by small willows. The rain abruptly ended.

Indians say one difference between themselves and white men is found in how we build fires. An Indian will build a small fire and sit close to it. A white man will build a big fire and sit away from the heat. I learned quickly the art of a small fire—a little toilet paper soaked with lighter fluid, wet twigs added first then larger sticks still dry in the middle. I warmed my hands and rested a few minutes, then began to set camp. I swept clear a patch of sand and pitched my tent, an old Eureka Timberland I had slept in across America, North Africa and Europe. As the darkness settled, I fired up a Coleman gas lantern. I blew up a military "rubber lady" air mattress, spread out my sleeping bag and hung a brass candle lantern from a gromlet inside the tent. Rain, hail or freezing weather, I had a cocoon for the night.

I warmed my supper right in the can in the coals of my fire. A can of Bunker Hill beef stew, more crackers and a can of peaches. I ate slowly, letting the heat from the stew warm first my face, then my belly. A luxury of canoe camping is that lots of weight can be carried, unlike backpacking where every pound is felt in the shoulders and legs. After I had emptied the cans, I crushed them with my heel and put them in a garbage bag I would carry throughout the trip. I stared into the fire and thought back to Seattle, and remembered my buddy and fellow transplant patient, Jesse Bolton, and the promises we had made.

I spent a total of four months in Seattle, separated from the South by thousands of miles and several tall mountain ranges. My brother, Bruce, matched me as a donor, and he, myself, my wife and my two young children flew west last April. First I was put through a week of tests to determine my health and stamina. My disease was in full remission, I was strong, and the doctors decided I was a good risk. They estimated I had about a 66 percent chance of surviving the ordeal. Eight days of intense chemotherapy began, the drugs given orally and intravenously to destroy my bone marrow, and any hidden multiple myeloma cells. Finally, about a pint of clean marrow was drawn with large needles from Bruce's pelvic bones, then dripped into my veins. The marrow cells knew to go to the core of my bones. I began the long journey back, having to rebuild a healthy immune system while healing a body that had been devastated by powerful drugs. Infections and fevers were a constant threat. My body could reject the new marrow. Simple pneumonia was a killer. All my body hair fell out. I suffered through skin rashes, bladder infections and long, sleepless nights.

Jesse was 40, only three years older than me, married with a couple of kids. He had served in the army, then used his training there to continue a career as a diesel mechanic. He was lanky and good natured and had entered the transplant program the same week as me. He hoped to rid himself of a form of Lymphoma. After we were discharged from the hospital as out-patients, we still saw each other almost daily when we came in for transfusions and medicines. We talked often of what we wanted to do once our 100-day program ended and we could return home.

"I been doing some thinking," Jesse said one day. "I got to get out of the diesel business. Too much exposure to chemicals." His eyes got shiny and reflective like the river water as he pulled a thought forward. "I want to try and buy a little bed-and-breakfast place beside the ocean. Something small—just a few rooms—but me and Beth could run it and cook and all. I could fish on the side. Some little place I could fix up, where from the windows you can look out over the Pacific."

I nodded and watched medicine drip from a glass bottle into an IV in my arm. "Me, I want to get back on the rivers. Ain't nothing like the North Carolina rivers. Paddle slow and easy, camp on the bank and catfish at night. I'm going to do that. Just as soon as I'm strong enough."

Raindrops brought my mind foward again. The coals hissed. I looked at my watch and the time was only nine p.m., but I was tired and ready for bed.

Day Two

I slept well, awakening occasionally to a steady drum of rain against the tent. Just before my get-up time of six a.m., the rain stopped, and I was faced with the hardest part of the trip—getting out of a

warm sack into the cold, damp air, dressing and breaking camp. I allowed myself an extra 15 minutes, then heaved upward into the real world.

I fired up my Coleman lamp, then my pack stove to heat water, then began the reverse ritual of deflating my air mattress, cramming my sleeping bag into the stuff sack and breaking down the tent. Soon the water was boiling and I fixed a large, strong cup of instant coffee sweetened with lots of raw honey. Breakfast was three packs of instant grits with bacon bits and butter. By the time I had packed the canoe and policed the ground for any trash, the river was visible in the weak light of early morning, fast-flowing, mist-shrouded and gray as the sky.

I had hardly paddled a hundred yards before the low banks rose sharply into 100-foot bluffs. Just ahead was a landing to the state park, but I quickly swept past it and in only minutes was passing another sign marking the exit boundaries of the park. The banks lowered again until they were only a few feet above the river.

Rivers remind me of life. They flow on and on and on, pulled by gravity to a common pool in the sea. Man can dam up a river, but she will flow over the obstacle or around it and continue on. She will rise with high water, run sluggish and slow in time of drought, but will return eventually to her average depth. A man can depend on a river; he can ride her for years, but she will be there long after his life has ended, and for centuries remain virtually the same.

I spotted my first wild geese at mid-morning. About 20 Canadas were feeding in shallow water beside a sandbar. A gander spotted me and began honking a warning, but the geese did not take flight, only retreated into the brush along shore. Over the course of the day I saw probably 200 geese, some feeding in the water, others flying in V formation against the sky. Ducks were also plentiful, but were skittish and quick to take flight. At a bend in the river where several logs had jammed up, the carcass of a 6-point buck was entangled. The deer had been gutted, his hind feet bound with wire—probably shot illegally by someone who had dumped the body either from fear or in flight. There were lots of muskrats, and occasionally large fish broke the surface of the river. I wished I had time to stop and throw out a baited line. But I had a certain amount of miles to make, so I kept to steady paddling, the motion as automatic as if my arms were powered by a machine. Some rain fell, but not the downpours of the previous day. Cold, canned spaghetti with meat balls for lunch, more crackers and Kool-Aid. I slipped across the land at a speed I estimated to average four miles per hour. Late afternoon was upon me when I spied the first bridge on the outskirts of Kinston.

After two days of peace, the din from rush hour traffic seemed especially loud beneath the bridge. The Neuse winds right through downtown Kinston, the curtain of trees I had grown accustomed to suddenly was replaced by buildings, cars and people. No one seemed to notice me, or if they did they only glanced, for they were too involved in the daily chores of their own lives. I passed under another bridge, then slipped by a small park where the remains of a Confederate gunboat lie. Another bridge, and the river turned sharply and flowed parallel to a boulevard where I spied the signs for two motels, both backed right up to the river. Dark was only an hour away, I was tired, hungry and chilly and I thought of how easy it would be to tie up here, march up to one of the motels and get a warm, clean room for the night. A 7-Eleven sat across the street—cold beer to soothe aching muscles. I made myself push on, pulled harder at the water to leave civilization behind. I passed through the boundaries of town and once again was engulfed by trees. Twilight was falling and as soon as I had outdistanced the grind of traffic, I hunted the banks for a place to set camp. Beside where a small creek flowed into the river, another sandbar had formed. I ran the bow up on shore, then worked fast, hoping to outpace the dying light. A can of chicken and dumplings for supper, more fruit. I sat before my Indian style fire, steam rising from my damp trouser legs.

By eight o'clock I was in the tent getting ready to snuggle into my bag, read a little by candle light, maybe listen to some music on a radio head set I had brought along. As I was undressing, I heard the first explosion of water—a sound like a large fish breaking surface, but much too loud. I shone my flashlight on the water, but saw nothing. I wondered if someone had thrown a large stone into the river. Some local yokel here to harass me? Another slap of water. Another. I swept the beam of light through the trees, along the shore—nothing. Then I spied the beaver swimming by, only his head visible. When the light hit him he arched his back and slapped the river with his broad, flat tail, and dove. I sighed in relief. I had noticed several gnawed tree trunks when I was setting camp, but had not given it much thought. The beavers didn't like my company and throughout the night, they thundered warnings up and down the river. I slept fine. Beavers have large teeth, but they don't carry guns or knives.

Day Three

I was out of the sack right at six a.m. I knew I needed to make a lot of distance—more than 30 miles to ensure that I made it to New Bern the next day. As the river neared the coast, it widened and the current slowed. I knew wind might also become a factor. I worried that the tide might even affect me. On the lower Cape Fear, I'd seen the current actually flow up-river when the tide was coming in. I downed my breakfast of grits and coffee, packing the canoe between bites and sips. The sky was still gray, but no rain had fallen during the night, and the radio weatherman had said clearing might begin late in the afternoon.

The third day was a charmer. Plenty of waterfowl, trees hung with Spanish moss. I rowed hard and steadily, marking my progress on my map by noting creek conjunctions. The wind picked up, but was usually to my back, and it further sped me along. I passed lots of fishing shacks, but they were all abandoned. By mid-afternoon, I was in low, swampy marsh land, the river often flooding well

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Tim McLaurin is the author of two works of fiction, The Acorn Plan *and* Woodrow's Trumpet. *A memoir,* Keeper of the Moon, *will be published this month.*

into the stands of cypress trees. I began my search for a campsite early. Finally with twilight closing down, I found a patch of ground that was about a foot above the water. The island was studded with cypress trees, but there was room to pitch my tent. As I worked to set camp I worried that if the current rose much, my tent would flood. But the ground was littered with leaves and small sticks, evidence I was probably above the high-water line. I heard the first slap from a beaver, then more and more as they swam by to check me out. I finished setting camp by the light of my Coleman lantern. As I warmed by my fire, I studied the map and realized I was only about 12 miles outside of New Bern. I knew I had the trip licked then, and even if I ran into strong currents or winds on the broad water above New Bern, at least by dusk I would make the yacht marina. The clouds were breaking and a sliver of moon appeared and reappeared. I caught a glimpse of Mars, hanging red and angry-looking in a patch of open sky. I felt good. I decided to pamper myself and fry up some corn bread to go with my usual fare of stew and fruit. On my headphones, I picked up a strong country music station out of New Bern and listened to songs about whiskey and hard work and long-suffering women. My thoughts flowed backwards again and I remembered the day I left Seattle.

I was saying goodby to the nurses and doctors and other staff. I was anxious to leave the hospital, leave the West Coast and set my feet on Southern soil. One of the newer guys was dying and a stream of family and doctors came in and out of his room. Jesse sat in the out-patient room hooked to a slow dripping bag of antibiotics. He'd had a rougher time than me. A fungus kept showing up in his spinal fluid and lungs. I shook hands with him and told him I'd stay in touch. I assured him he'd probably be going home within a week or two.

More than a month had passed before I called the transplant unit to let them know how well I was progressing. A nurse told me Jesse had been readmitted to the hospital just a couple of days after I went home. The fungus had invaded his brain. She informed me he had been dead a week.

Day Four

I was on the water before the sun crested the horizon. The sky was clear and blue, the temperature expected to climb into the 50s. After a couple of hours of hard paddling, I reached the point where the river widened to a half mile. Reed thickets lined the shore.

For the first time in four days, I could see my reflection in the water. I realized then what the solitude of the trip had meant to me—a world minus mirrors, without people's stares. I studied myself in the water. My hair was starting to grow back pretty good, my face was still swollen from drugs, but I was looking better day by day. Most of all, I was alive.

Numbered channel markers guided me in. The river made another sharp turn and widened to what must be a full mile. I scooped some water into my mouth, and it tasted of salt and mud. A couple of miles ahead, I could see a train trestle spanning the river. I knew just beyond the railroad was the highway 17 bridge and then the marina.

Nature wasn't through with me yet. The wind was now blowing directly to my port side, a breeze strong enough to whip up the white caps. I paddled the hardest I had on the entire trip, but the wind kept driving me slowly, but steadily, to shore. Twice I was driven into submerged pilings that threatened to rip through the bottom of the canoe while I bucked forward and pushed with my paddle to dislodge the craft. I would rest a few minutes, cling to reeds to steady the canoe and curse a little to ease my frustration. I found my best tactic was to turn the canoe directly into the wind and head across river until I was a couple hundred yards from shore. Then I could turn down river, and by paddling hard on the leeward side, make a quarter mile or so before the wind drove me once again onto shore. I wasn't really concerned; mid-morning had only passed and I knew I was within a couple miles of the marina. If it took until dark, I would get there.

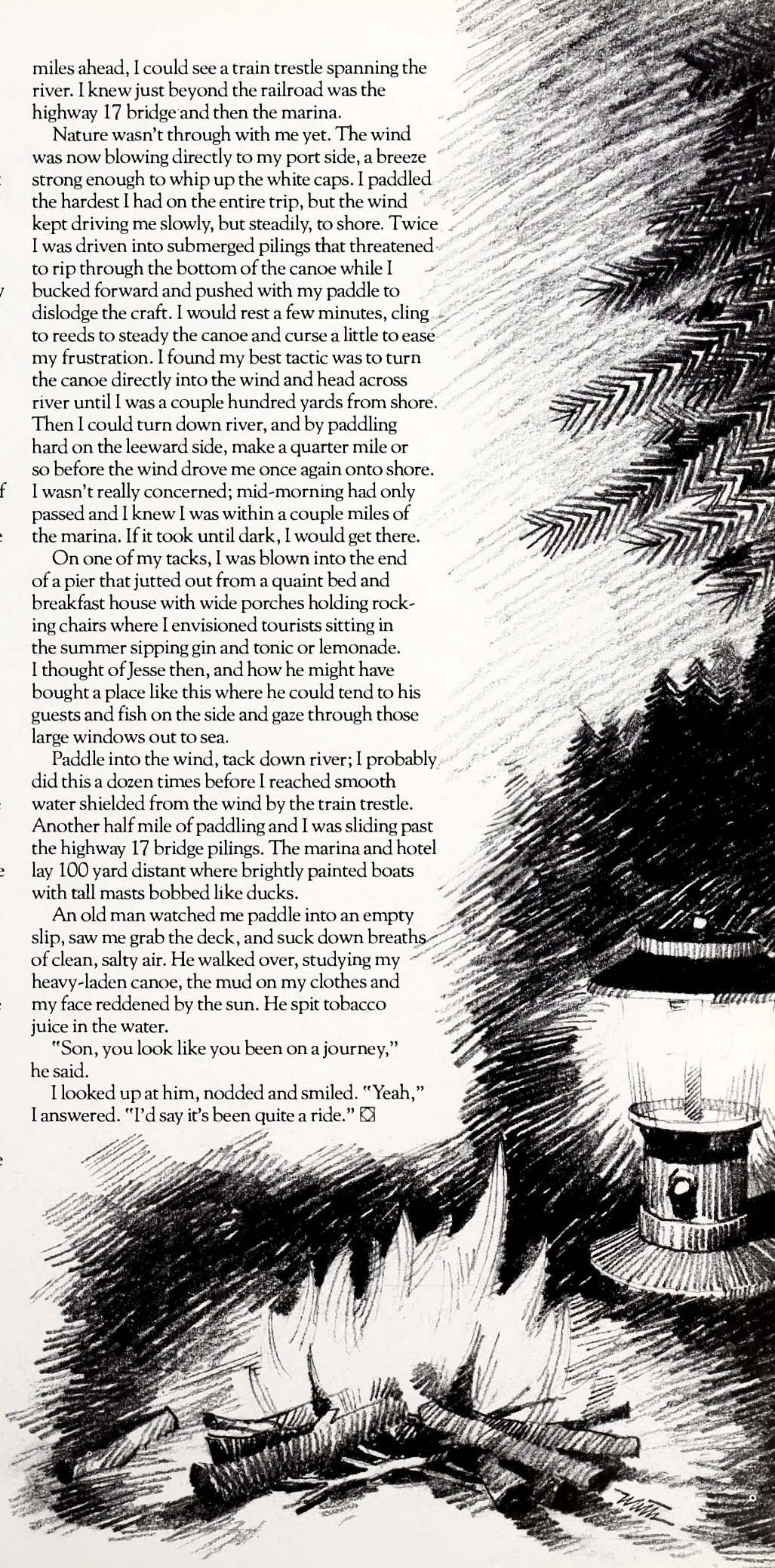
On one of my tacks, I was blown into the end of a pier that jutted out from a quaint bed and breakfast house with wide porches holding rocking chairs where I envisioned tourists sitting in the summer sipping gin and tonic or lemonade. I thought of Jesse then, and how he might have bought a place like this where he could tend to his guests and fish on the side and gaze through those large windows out to sea.

Paddle into the wind, tack down river; I probably did this a dozen times before I reached smooth water shielded from the wind by the train trestle. Another half mile of paddling and I was sliding past the highway 17 bridge pilings. The marina and hotel lay 100 yard distant where brightly painted boats with tall masts bobbed like ducks.

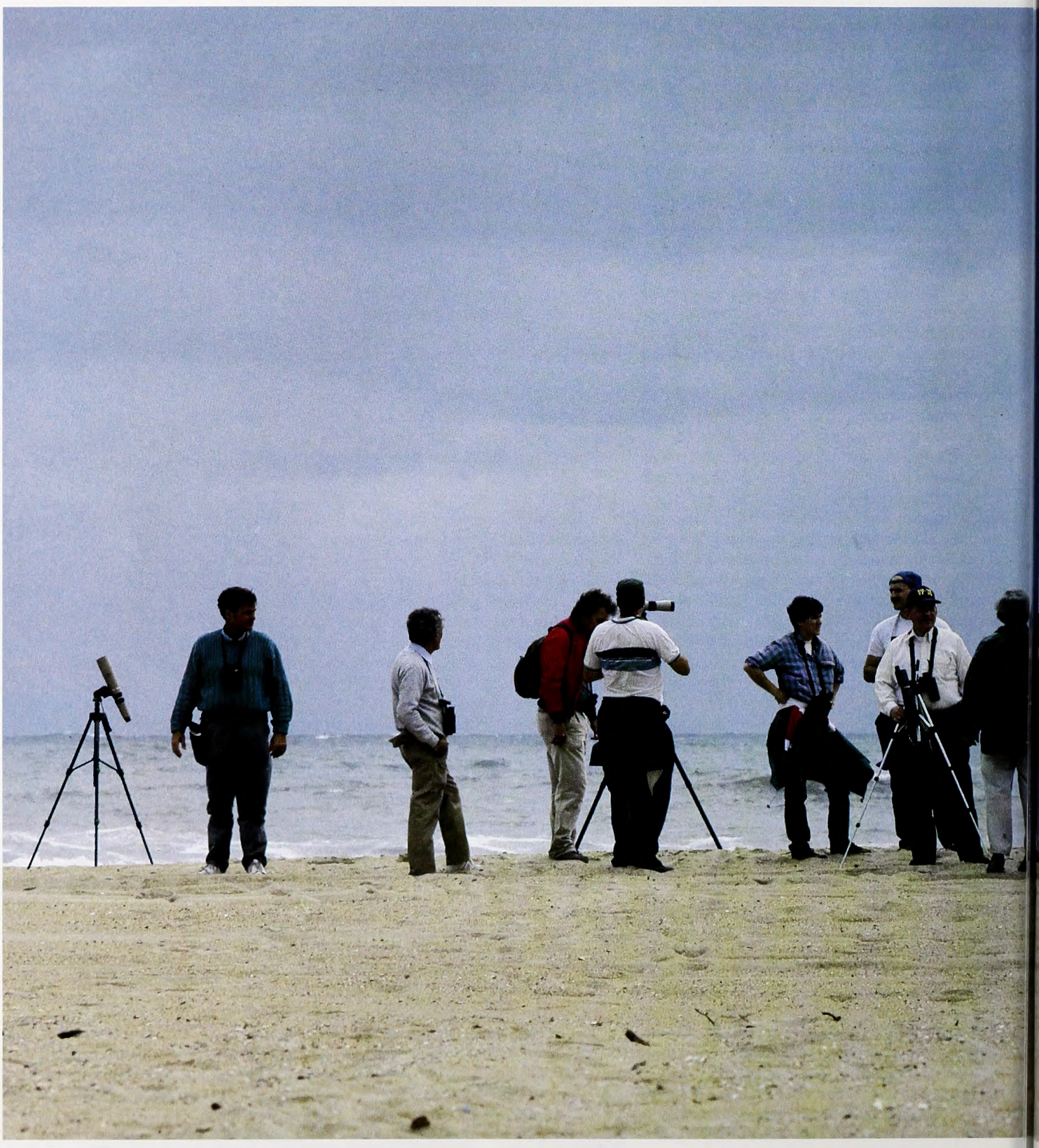
An old man watched me paddle into an empty slip, saw me grab the deck, and suck down breaths of clean, salty air. He walked over, studying my heavy-laden canoe, the mud on my clothes and my face reddened by the sun. He spit tobacco juice in the water.

"Son, you look like you been on a journey," he said.

I looked up at him, nodded and smiled. "Yeah," I answered. "I'd say it's been quite a ride." ☒



Birding the Outer Banks



Grab your binoculars and take a closer look at the rich bird life on our barrier islands. Here's where to go and what you may see.

written and photographed by Joel Arrington ©1991

S-T KITE, PELAGIC, RT-HAWK, and KI-KI-KRR adorn license plates on a row of cars in a Cape Hatteras National Seashore lot. Vanity plates trumpet drivers' passions, and these are no exception. They signal the burning interest of birdwatchers gathered at the tip of Cape Hatteras, one of the best spots within one of the best locations in America for not only numbers of birds, but for unusual birds as well.

Countless birding hobbyists visit these islands, some on tours organized by guides who place advertisements in special interest publications. They are drawn by resident birds and a variable flow of migrating species, including some rare and uncommon birds they have a better chance of seeing here than practically anywhere in the country.

KI-KI-KRR, a phonetic representation of the cry of the secretive black rail, is inscribed on a plate attached to a car owned by John Fussell, a consulting biologist and one of the leading authorities on birds of the Outer Banks. He joins a group of birders laden with binoculars and tripod-mounted spotting scopes as they slog down the beach toward Cape Point.

Gusty northeast winds whip the group and tear words from their mouths so that they must shout or stand close to talk. This spring northeaster, which had moved in the previous day, had ended their offshore trip out of Oregon Inlet only a little prematurely. Aboard a chartered boat, about 24 birders had spotted a good volume of black-capped petrels, over 120, but had been a little disappointed in the variety of pelagic birds. Pelagics are species that spend most of their time over the open ocean, far from land.

"Normally a strong northeast wind pushes a lot of pelagics in here," Fussell tells me, looking out over whitecaps on big gray seas. "They are migrating north at this time of year, so the wind shoves them westward.

***Birders gather** at Hatteras to observe both common and uncommon species. Cape Point is a particularly good observation spot during bad weather since storms or hurricanes may bring in pelagic or even tropical birds that are not normally seen here. Offshore boat trips are available to see pelagic species.*

***John Fussell III** is an avid birder and one of the leading authorities on species found on the Outer Banks. Among the rarest visitors he's seen is a black-backed wagtail that nests in Siberia. Fussell is co-author of the comprehensive brochure, "Birds of the Outer Banks."*

It makes the point here at Hatteras the best place south of New England for seeing petrels, shearwaters and skuas."

The Outer Banks' geographic location is perhaps the main reason biologists and birders find such rich opportunity here. The Eastern Flyway is a corridor for spring and fall bird migrations. Evolving over millennia, this migratory path defines a seasonal flow of avian travelers along the continental edge. Misdirected flights from the west may accumulate at the edge of the continent. Birds are not all unerring in their travels, and weather may move them off course. When they run out of land, they stop. Because the long, slender barrier islands contain so little land mass, birds tend to concentrate. Varied habitat and protected sites here, such as those within the Pea Island National Wildlife Refuge, provide feeding and resting locations for many avian species. The Gulf Stream, flowing only 12 nautical miles off Cape Point, has its own associated pelagic birds, which sometimes tend to wander or are forced inshore. For these reasons and others, the Outer Banks are particularly well known among ornithological enthusiasts for migrating shorebirds, as well as for offshore pelagics, but migrating land birds can also be varied and numerous in the fall.

We didn't see much of interest that morning at Cape Point, however. Fussell guessed that the storm had not been blowing long enough to build up any number of offshore birds. He took the occasion to run down seasonal opportunities for bird watching in the Cape Hatteras National Seashore and especially for unusual species.

Spring remains good, he said, for jaegers and the south polar skua. The latter, a gull-like bird from Antarctica, wanders into the North Atlantic sometimes as far as Greenland. In his excellent brochure written for the Park Service, Fussell lists it as uncommon in late May and early June, and rare through September. Birders also may be delighted to see an arctic tern, which occurs here sparingly in May, a Sabine's gull, and various storm-petrels. Of them, the rarest would be the white-faced storm-petrel, which Fussell lists as occasional from July to October. Bird watchers would also be happy to spot a long-tailed jaeger, which occurs most abundantly here in May, but remains uncommon.

Scientific birders apply specific meanings to abundance designations. *Rare* means recorded, but not seen every year. *Occasional* designates birds seen only a few times during a year, while *uncommon* refers to birds that are usually present, but are not certain to be seen. *Fairly common* means seen most of the time in the proper habitat. *Common* denotes birds easily seen in the proper habitat.

Land birds to look for, in the spring, Fussell said, include the gray kingbird, a species of Florida and the Caribbean, and the American swallow-tailed kite, normally a bird of tropical and Southeastern wooded river swamps. He also said that possibilities are fairly good for seeing rare to occasional bay-breasted and blackburnian warblers in suitable habitat at this time of year.

From late May to early September, a band-rumped storm-petrel would be a prized sighting for any birder. A deep water pelagic that nests in the easter North Atlantic, it wanders west in summer. Fussell says it is more likely to be seen off Oregon Inlet and Hatteras than anywhere else in the United States. Among summer sightings of note are Leach's storm-petrels, flying like night-hawks low over the ocean surface. You'll have to look closely to distinguish them from the common Wilson's storm-petrel.

One May when we were fishing off Cape Lookout, a white-tailed tropicbird caused quite a stir aboard our boat when it came dipping over our wake and hovered there for some minutes while we *oohed* and *aahed* and admired its black and white plumage and two long tail feathers. One of the species many birders travel to the Outer Banks to see is the Audubon's shearwater, common here in summer. It breeds in the Bahamas and the West Indies and wanders north as far as Cape Hatteras. The days just after a hurricane has passed hold particularly good

***Many Outer Banks species** of birds, like this snowy egret standing in a Pea Island marsh, are fairly common. Nearly 400 species have been sighted on the Outer Banks, some quite rare. There is even the chance that bird watchers will spot western species that have been carried across the continent by powerful weather fronts.*

Once a rare sight, *the brown pelican is again fairly common along the beaches where it can be seen skimming inches above the crests and troughs of waves. Brown pelicans are making a comeback following the ban on DDT.*

prospects for exotic birds.

By August and September possibilities improve for sighting the Sabine's gull, rare in May and September, and for three species of jaegers. The white-faced storm-petrel, most elusive of all pelagics, is a much hoped for sighting from July into October, Fussell said.

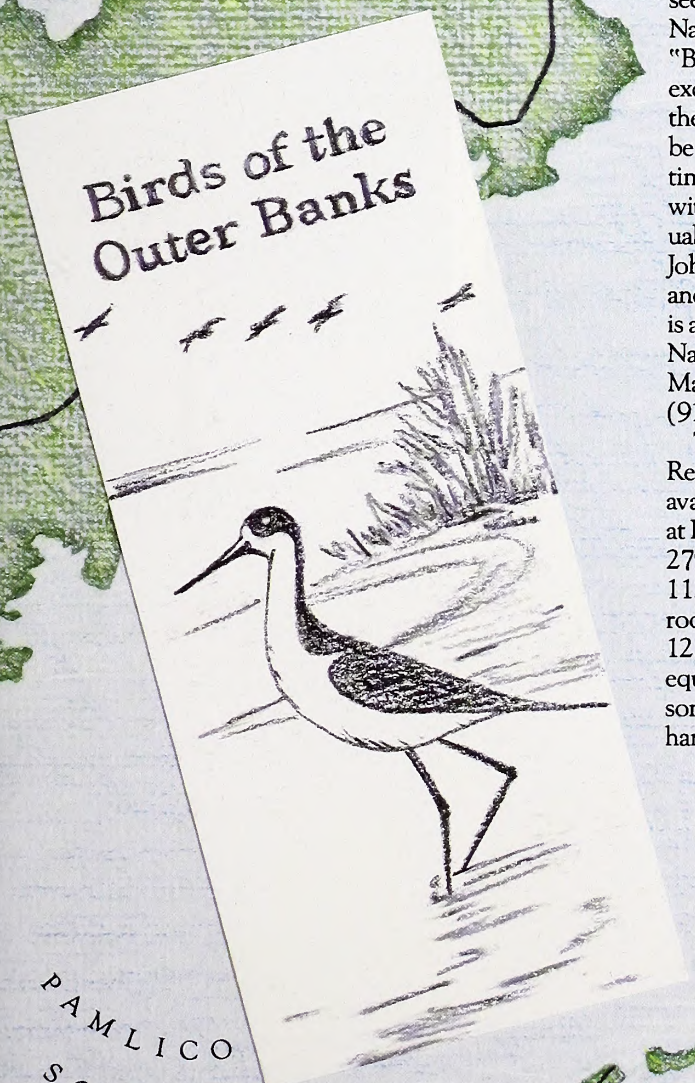
Fall brings a flood of interesting birds to the Outer Banks. The land bird migration here remains the best in North Carolina, although it is not as good as at Cape May, New Jersey, according to Fussell. One concentration spot is the north end of Pea Island, especially the dikes of North Pond. Here you are likely to get strays from the western United States, like the western kingbird and lark sparrow, the lark bunting and western meadowlark. Birding is sure to be excellent after a fierce cold front and its brisk northwest wind. You are more likely to see these western accidentals here than in the Piedmont, for example.

"A feature of the Outer Banks," Fussell said, "is the sheer volume of birds in the fall, particularly in the Pea Island impoundments." Rare birds often show up in the ponds rather than on tidal flats, birds like stilt sandpipers, long-billed dowitchers, hudsonian godwits (which typically migrate far offshore), Wilson's phalaropes and curlew, Baird's, and buff-breasted sandpipers.

Of course one of the most obvious and well known birding events in this state is the fall waterfowl spectacle along the Outer Banks. Large numbers of all the common species of ducks, geese and swans arrive. Of special interest to birdwatchers are the unusual fowl that can often be picked out of the flocks with binoculars, species like the Ross' Goose, an individual that seems to turn up every other year or so at Pea Island. Sharp-eyed observers may also spot a greater white-fronted goose or Eurasian wigeon. Indeed, the Outer Banks may be one of the best spots in the continental United States to see a Eurasion wigeon, Fussell said. The fulvous whistling-duck, resident from Texas to Central America, occasionally invades the South Atlantic Coast and has been sighted on the Outer Banks in all months.

Ferries crossing Hatteras Inlet and those traversing Pamlico Sound between Ocracoke on the Outer Banks and Cedar Island and Swan Quarter on the mainland are wonderful platforms for observing waterfowl, including brant and oldsquaw. Western Pamlico Sound is often loaded with oldsquaw and three species of scoters in fall and winter.

The Oregon Inlet groin attracts ocean birds of particular interest, including harlequin ducks, purple sandpipers and great cormorants in the fall. A strong concentration of hawks and falcons migrates through at this time of year, including peregrine falcons and merlin. The short grass habitat at Cape Point and the campground at Salvo may attract buff-breasted, upland, and Baird's sandpipers (occasional in summer and fall), and the



Nags Head

Manteo

Whalebone Junction
Information Center

Manns Harbor

Wanchese

Coquina Beach

Bodie Island
Visitor Center

Pea Island
Wildlife Refuge

Stumpy Point

Refuge Headquarters

Visitors can expect to see lots of birds on the Outer Banks virtually year-round, but experienced birders pick a season when they are likely to see the birds that interest them. The National Park Service brochure, "Birds of the Outer Banks," is an excellent guide that indicates both the rarity of bird species that might be encountered, and also the best times of year to see them. Combined with a good field guide, it is an invaluable aid to birders. Co-authored by John Fussell III and Marcia Lyons, and illustrated by Alan D. Barron, it is available free from Cape Hatteras National Seashore, Rt. 1, Box 675, Manteo, N.C. 27954 or by calling (919) 473-2111.

The Pea Island National Wildlife Refuge publishes a list of vertebrates available free by writing the refuge at P.O. Box 1969, Manteo, N.C. 27954 or by calling (919) 473-1131. The refuge provides restrooms and parking lots off N.C. 12. There are several birding trails equipped with spotting scopes, and some of the trails accommodate handicapped birders.

Rodanthe

Waves

Salvo

Hatteras Island

Avon

Buxton

Cape Hatteras
National Seashore

Frisco

Hatteras

PAMLICO SOUND

ATLANTIC OCEAN

Ocracoke Island

Like old friends *vacationing at the shore, two laughing gulls take a stroll down a wind-swept beach. Even these common gulls are interesting to watch as they soar over beaches or gather around docks to squabble over scraps of food.*

lesser golden plover (occasional in fall, rare in spring and summer).

In winter the tourists leave, cold wind blows in from the north and large numbers of loons and grebes arrive on the Outer Banks. Offshore, gannets plunge-dive into bait while inshore around the fish houses the chilblained birder may spot an Iceland, glaucous or lesser black-backed gull. Among large numbers of Bonaparte's gulls may be the uncommon to rare little gull, a native of Eurasia, but regularly sighted now along the coast.

On the Outer Banks, the black rail, the most secretive bird in America, is uncommon to occasional. Fussell has a good record guiding birders to their first sightings, however, by playing a recording of rail calls at night to stimulate the small black birds to call back and reveal their locations. Cedar Island, Ocracoke, Bodie Island and the marshes at the south end of Roanoke Island are good places to look for black rails.

The rarest birds Fussell has seen on the Outer Banks include a black-backed wagtail at Cedar Island. This is a land bird that breeds in Siberia. He also recorded at Portsmouth on the Core Banks a bar-tailed godwit, which is another Eurasian accidental. On May 28, 1987, Fussell saw 12 long-tailed jaegers and two south polar skuas at Cape Point—a red letter day indeed.

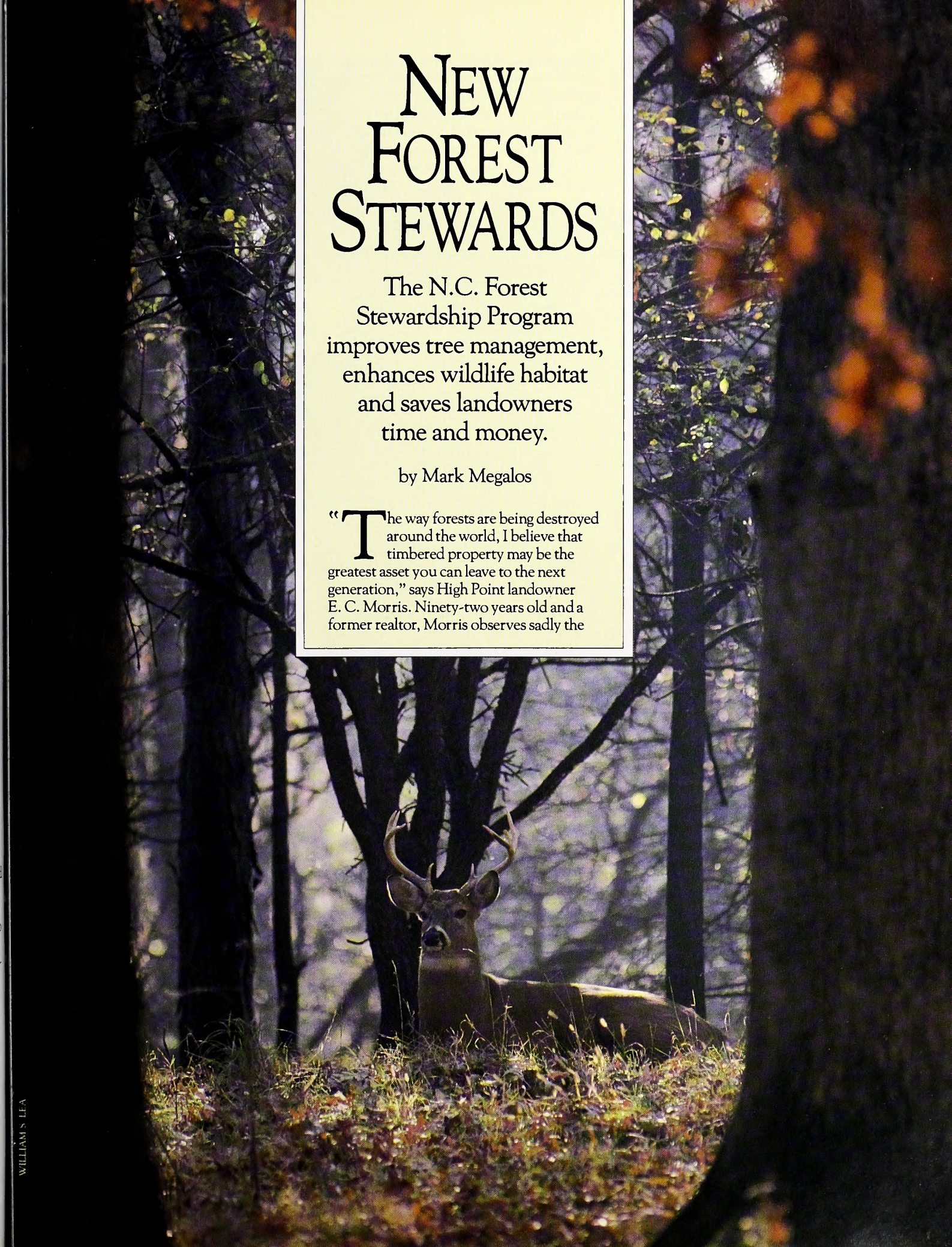
Visitors to the Outer Banks are advised to be wary of wind-chill in cool weather and insects during warm months. Accommodations are plentiful at Nags Head and at villages on Hatteras and Ocracoke islands. Write the Dare County Tourist Bureau, P.O. Box 399, Manteo, NC 27954, or call (919) 473-2138, for an accommodations directory. Information on transportation from the mainland to Cape Lookout National Seashore islands by passenger or 4-wheel-drive auto ferry may be obtained from the CLNS, 3601 Bridges St., Suite F, Morehead City, NC 28557-2913, phone (919) 240-1409. ⊠

New Forest Stewards

The N.C. Forest Stewardship Program improves tree management, enhances wildlife habitat and saves landowners time and money.

by Mark Megalos

"The way forests are being destroyed around the world, I believe that timbered property may be the greatest asset you can leave to the next generation," says High Point landowner E. C. Morris. Ninety-two years old and a former realtor, Morris observes sadly the



WILLIAM S. LEA

New Forest Stewards

worldwide destruction of forests, but over his lifetime he's also seen a lot of poor forest stewards right here in North Carolina.

Morris isn't one of them. He feels strongly about landowners' responsibility to improve their forestland not only for timber production, but also for wildlife and other resources. He practices what he preaches. That's why Morris' property was recently certified as a Stewardship Forest under a new program that promises to make a big difference in the way private forests are managed in the state.

The N.C. Forest Stewardship Program (FSP) is an innovative multi-agency effort to assist private landowners in improving and protecting their forest resources. Interested landowners define their objectives for enhancing the wildlife, timber, recreation, aesthetic and soil and water resources on their property. Next, a plan is prepared that will accomplish landowner goals for his or her forestland. In many cases the plan will be prepared by the county stewardship committee consisting of local resource professionals from seven cooperating state and federal agencies, including the N.C. Wildlife Resources Commission. In other cases a consultant, under contract with FSP, may prepare the plan.

As landowners enhance their forest resources, their property is certified as a Stewardship Forest. Certified Stewards are recognized with a framed certificate, and a Stewardship Forest sign with a mounted bluebird box to post on the property.

But what about the real incentives? A plan, a certificate and a sign might be nice, but they don't necessarily put any beans on the table. Nor is an innate love of trees a necessity. Indeed, what's attracting many landowners to the Forest Stewardship Program is that it can save them time and money.

How does FSP save time? Instead of having to deal with several federal and state agencies that may sometimes provide complex, and possibly even conflicting, information about soil and water regulations, tree growing and wildlife, the landowner who participates in FSP gets a single, unified plan for the entire operation. He deals with basically one program that will provide the educational and technical assistance to help avoid all the confusion.

And that's not all. The landowner can also tailor this overall plan to suit his own needs. If he wants to concentrate on maximizing his long-term tree-growing capabilities, he can do it. If he wants a forestry plan that provides more wildlife habitat, it's entirely possible. It's even possible to fine-tune the plan to favor specific species like white-tailed deer and turkeys, or small game like bobwhite quail and rabbits. Finally, as part of the plan, the landowner will be advised of any government cost-share opportunities available that can help him save money while implementing the plan. Landowners with an approved stewardship plan are entitled to Stewardship Incentives Program (SIP) cost share benefits to implement many types of resource enhancement activities.

Imagine how much time and knowledge it would take for an individual landowner to approach each agency separately and achieve those goals. Small wonder FSP is gaining participants.

LLOYD B. HILL

***Landowners can tailor** their forest stewardship management plan to improve habitat for species like this cottontail rabbit.*

The Forest Stewardship Program, funded through the U.S. Forest Service, became federal policy and law in the 1990 Farm Bill. The program authorizes information, education and technical programs to encourage, assist and recognize private landowners who keep their lands and natural resources productive and healthy. Funding of this program—up to $100 million annually through 1995—is authorized by the Forest Stewardship Act of 1990. For fiscal year 1991, the appropriation is $19.9 million nationwide.

Though young, the program has already attracted a lot of interest from landowners around the state. Not far out of Hillsborough in the northern Piedmont lies a field and forested tract that's the apple of owner Ed Purcell's eye. On a hazy summer morning, with bobwhite quail calling softly in the distance, the Orange County Forest Stewardship Committee toured the property with Purcell.

The brush dripped from the previous evening's thunderstorm as the committee viewed the practices that typify good stewardship. Stewardship practices on the property were designed to enhance and perpetuate turkey, quail and rabbits while growing sawtimber, halting erosion and providing access for recreation.

"We need to look after all the resources—the soil, water, air—whatever you have to work with," says Purcell. The Forest Stewardship Program closely fits the goals that Ed has for his land and for any landowner with a concern for the environment. "I think it's great that the program is open to anyone that's interested and that the practices recommended aren't that expensive."

Forest stewardship seeks to put all of the forest resources on an equal footing. While economics and timber production returns may still drive the direction of land management of private forests, landowners like Ed Purcell and E. C. Morris are placing a lot of value on other benefits of the forest.

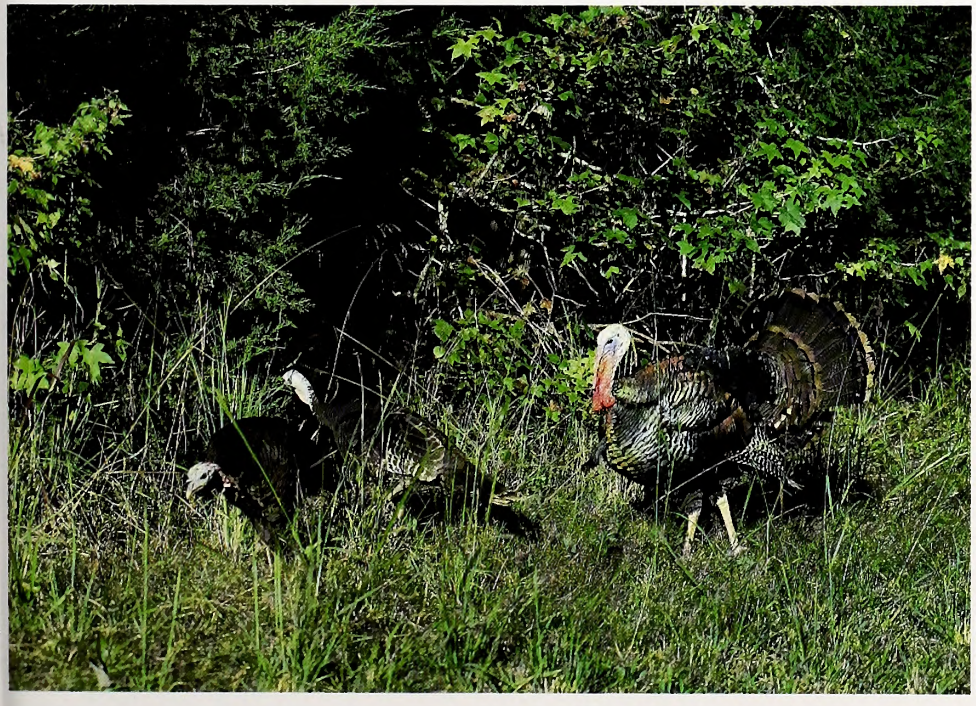
"I've got three boys, age 5, 7, and 11, who I eventually hope will take over the property," said Purcell. "I hope they'll get involved with the wildlife aspects of the property. They're getting a lot of conservation and environmental education in the schools right now." Ed's boys have learned a lot from the examples set by both their father and grandfather. Ed recounts, "My grandfather purchased a tract in the early 1950s. He later planted 90 acres of loblolly pines under the Soil Bank Program." Ed has recently thinned his grandfather's trees and in 1986 set pines on highly erodible fields of his own.

Ed's stewardship activities also include wildlife food plantings of milo and soybeans on old logging decks, erecting wood duck boxes on the edge of a beaver swamp, maintaining den and nest trees and seeding roads with "wildlife-friendly" mixes of seed. As Ed remembers it, "When we got involved in the program we started thinking about wildlife needs and we decided to go with a mix of clover and orchard grass rather than fescue." The proliferation of fescue in pastures and on woods roads has been implicated as a reason for the decline in small-game populations throughout the South. It's small changes like this that can make a big difference, and this type of commitment is what distinguishes a forest steward from other landowners.

Soil-conservation projects, like grassed

KEN TAYLOR

The Forest Stewardship program *not only helps landowners develop good forestry practices, it also incorporates wise management of other resources, including wildlife. Here, program representatives and biologists meet with a landowner to inspect management practices that have been applied to a farm.*



LLOYD B. HILL

The wild turkey *is making a comeback in many parts of North Carolina, and landowners can choose management options that are more likely to attract turkeys and provide them with suitable nesting cover.*

New Forest Stewards

water ways and field borders, surround a 74-acre field that was put into wildlife vegetation cover through the Conservation Reserve Program in 1989. Through assistance from Wildlife Commission biologist Larry Warlick, and Greg Walker and Todd Roberts from the Soil Conservation Service, Ed used a combination of lespedeza, clover and native vegetation to halt erosion on these fields for a 10-year-period. Fertilization and annual mowing of alternating strips will keep the field productive for wildlife. Roberts attests to the success of these practices.

"We came back to check the field yesterday and flushed four deer by the time we reached the middle of the field. Back in the pines we came across a wild turkey nest with 12 eggs in it."

Ed conducts most of the stewardship activities on his property by sandwiching them in between contract hog production and the multitude of his other farming activities. The Purcell family's enjoyment of the property has increased immensely through opening of an access road and prescribed burning. "We burned to open up the pine stands and get rid of vine problems," he said. "It was just too thick with undergrowth to even walk through. I like to walk on Sunday afternoons with my boys in those stands now."

Ed is a real believer in prescribed burning. He got a little assistance from the N.C. Forest Service through its Landowner Hazard Reduction Prescribed Burning Program. "There are many good reasons to prescribe burn pine stands. Such burns reduce wildfire hazards, control undergrowth, improve tree growth and enhance wildlife habitat. And in 10 years when somebody comes to look at the timber, the buyer can see what he's getting." After getting started, Ed now does the burning himself, often with the help of a neighbor or two. Bradsher Bowling, Orange County Ranger boasts, "Ed's even had a former county commissioner out here to help him burn."

Prescribed burning may not be the answer for all landowners, of course. For example, while wildlife species like bobwhite quail benefit from prescribed burns, cottontail rabbits may need more piles of cover and thickets of briers. The beauty of FSP is that such needs can be worked into the overall plan.

Bowling speaks highly of Orange County landowners and the potential for dozens of other stewardship forests throughout the county. "It's an idea whose time has come—in fact, it's way past time. I like the concept behind the Forest Stewardship Program better than any program we've had to date, and I know we can make it work."

One hundred miles southwest of the Purcell property is another forest landowner who shares a commitment to the land in his special way. When asked about his desires and expectations from his forest, this proud landowner shares his feelings about stewardship.

"The economic potential of growing timber for market is certainly a motivating factor, but abundant wildlife (both game and non-game), and pure water well-stocked with fish, waterfowl and other aquatic wildlife are just as important," says Boon Chesson, carpenter and father of two from Montgomery County. Chesson has unique objectives for the 100 acres of forestland on which his family resides. Among his interests are re-establishing longleaf pines and encouraging the growth of waterfowl, non-game and game populations. He also wants to put in recreational trails and observation areas to better enjoy his property.

The Chesson property is bounded on three sides by the Uwharrie National Forest and his stewardship efforts will add to the public benefits of clean water, abundant wildlife and quality timber received from area forestlands. Like other stewards, Chesson shares a commitment to his land, its plant and animal inhabitants, and he hopes to pass this responsibility on to his children by example. "I need all the help I can get and I appreciate the professional help that the program gives me," he says.

Landowners are anything but typical or predictable and past efforts to encourage them to manage their forests have met with limited success. "What's different about the Forest Stewardship Program," says program coordinator Bill Williams, "is that we encourage landowners to set the direction for their property by asking them to set their goals in priority order. If a landowner desires ideal quail habitat, sustained timber yield, recreational opportunities and clean water from the land, we'll draft an integrated resource plan that will achieve those goals over one-year or several five-year cycles."

Many of North Carolina's private forest landowners possess a willingness to manage their forests and leave the land in better condition than when they received it. The Forest Stewardship Program offers them an opportunity to receive technical assistance and guidance to improve the forest for today and tomorrow. Interested landowners needn't be wealthy to improve their forest's potential for wildlife, timber, recreation or environmental protection. In fact, pre-harvest planning and minor changes in standard management can yield significant benefits. Landowners with as few as 10 acres of forestland are eligible to participate in the program.

"Stewardship activities are selected with the landowner's resources and ability in mind," Williams says. "We emphasize the modification of existing practices to achieve multiple benefits rather than suggesting costly investments."

Resource professionals and private consultants are cooperating in each county in North Carolina to make the Forest Stewardship Program a reality for the state's private forest landowners. With this unprecedented cooperation among seven state and federal resource agencies, N.C. State and Duke Universities, and the Governor's Advisor on Agriculture, program acceptance has been overwhelming with activity in most counties throughout the state. As the Stewardship Incentives Program, a companion cost-share program to FSP, gets underway, stewards with an approved plan will be eligible for financial assistance.

Given these incentives, it's looking more and more as though forest stewardship is an idea whose time has come. ☒

Can You Be A Forest Steward?

You bet! Landowners who become participants will benefit from a combined program through a committee of agencies that include the N.C. Cooperative Extension Service, N.C. Forest Service, N.C. Wildlife Resources Commission, Soil Conservation Service, Agricultural Stabilization and Conservation Service, U.S. Forest Service and N.C. Division of Soil and Water Conservation. Information and assistance is available locally from these agencies, or you can write to the N.C. Forest Stewardship coordinator at: P.O. Box 27687, Archdale Building, Raleigh, N.C. 27611-7687.

MELISSA McGAW

Bucks & Scents

Figuring out the deer scent game takes more science than sense.

by Eddie Nickens ©1991

Oh, man, smell that bacon! Nothing wakes you up like a strong whiff of that stuff. It's 4:30 in the morning, and there's just enough time for a quick breakfast before heading out to meet Steve by the far barn. You open the back door to check the temperature—mid-30s, air still as crystal. A perfect deer hunting morning.

No time for a shower—a double dose of deodorant ought to get you through the day. Brush your teeth, pull on the long underwear...hey, where'd they go? They were right there in the drawer, weren't they? Oh, man, they're still in the laundry bin, not even washed! Gotta have 'em, though. At least they're dry.

Everything else is in order. Your parka is slung over the outboard motor where you left it after yesterday's duck scouting mission; your boots are on the back door stoop. It's almost 5:00, a.m. Jeez, Steve's gonna be mad. Where does the time go?

You slip out the back door, trying not to wake the dog. But there she is, the little darling, tail thumping the ground, ready for another boat ride.

"Sorry, girl," you say. "You can't go today." How can a dog make a man feel so guilty? You just have to stand there and rub her head for a few minutes. She leans heavily against your leg, and gives your hand a good-natured lick. She's going to be heartbroken.

When you pull into the field, Steve's car is nowhere to be seen. Hah! Lazy slob. Just enough time for a last smoke. You're halfway through the cigarette when headlights cut across the field. You step out of the truck, and slip a few Slim Jims into your pocket for a mid-morning snack. Steve pulls his coveralls from a pine-filled garbage bag and you're both ready to roll.

Oops, almost forgot. With great ceremony you pull out the magic bottle and sprinkle a few drops of Tink's No. 69 on your boot soles. There. Now you're virtually invisible. After all, everyone knows how sensitive deer are to smell.

STEVE M. EBERHARDT

This buck will use scent *to mark its territory by scraping a bare patch on the ground, then urinating on the spot.*

Or do we? Of the white-tailed deer's three primary lines of defense—sight, sound and smell—most hunters give the last the least consideration, even though deer experts tell us that a deer's sense of smell is its keenest and most relied-upon defense mechanism. We climb trees to put ourselves out of sight and don fleece outerwear to move silently. But to remain odor-free? We rely on a few drops of supposed magic potion. The stuff's *got* to be good, we figure. After all, we've paid $11 an ounce for it.

A savy hunter, of course, has already spotted many basic mistakes made by that hunter—eating heavily seasoned food or food that may cause gas, using deodorant, wearing soiled clothes or clothes scented with motor oils or other unnatural odors, not bathing to remove accumulated human scent, smoking, gathering dog scent—and so on.

For many deer hunters, overcoming human odor—through cover scents or attractors—is given low-level status when preparing for a hunt. We tend to walk to our stands along the same trails, regardless of wind direction; we wear our hunting clothes while huddled next to the campfire or fireplace; we smoke, eat and even chew tobacco while on the hunt. We rely on luck and a dash of buck lure to hide our presence in the woods. But if you're anything like the hunter in the scenario just described, likely as not you spend more than your fair share of early mornings perched in a tree wondering, "Where's the venison?"

A tree stand *allows hunters to remain hidden from wary bucks, but it does not prevent detection by the deer's keen sense of smell. Hunters can pick from a wide variety of commercial scents designed to simulate food, cover human odors or imitate mating deer scents.*

A deer's sensitivity to foreign scent is matched only by the sensitivity of scent makers to the desire of hunters for high-tech gadgetry. To that end, the market has been flooded with literally hundreds of scent options. A recent visit to my favorite sporting goods store revealed the following scents and scent-based hunting aids: cover scents in coon, corn, apple, acorn, pine, peanut butter, skunk, fox, earth and vanilla. There were territorial infringement scents; scents to be used only when rattling during the rut; scents purportedly "collected only during the hottest 5-hour period of the doe estrous cycle;" rutting buck urine; dried tarsal glands; interdigital gland scents; and scents with time-release drippers for the making of artificial scrapes.

So, what'll it be? Tarsal gland or metatarsal gland? Scent-impregnated easy-air-flow wafer applicator or the hot new sling shot-and-scent-pellet distribution system?

Before you pull out your wallet, let's debunk a few myths, or at the least report on those who claim to have done the debunking. For years the "100 Percent Natural" doe-in-heat type scent lures were the most popular types of scent aids on the market. Most of these lures, the manufacturers claimed, were collected from penned white-tailed deer during the peak hours of the 24-hour estrus. Bottled in glass, the scents were gobbled up by hunters willing to pay perfume-level prices for what they figured was deer hunting's Sure Thing. But an investigation by the Michigan-based Fred Trost's Outdoor Club (not-so-subtly dubbed "Scent Scam") revealed that the chemical structure of these urine-based pheromone scents often broke down too quickly for them to be used as advertised. That meant many scent manufacturers were exaggerating the quality and effectiveness of the lures they produced. In fact, research has

suggested that deer are actually attracted to the ammonia released by evaporating urine, and that it doesn't matter if the urine is that of a cow, a deer or a man.

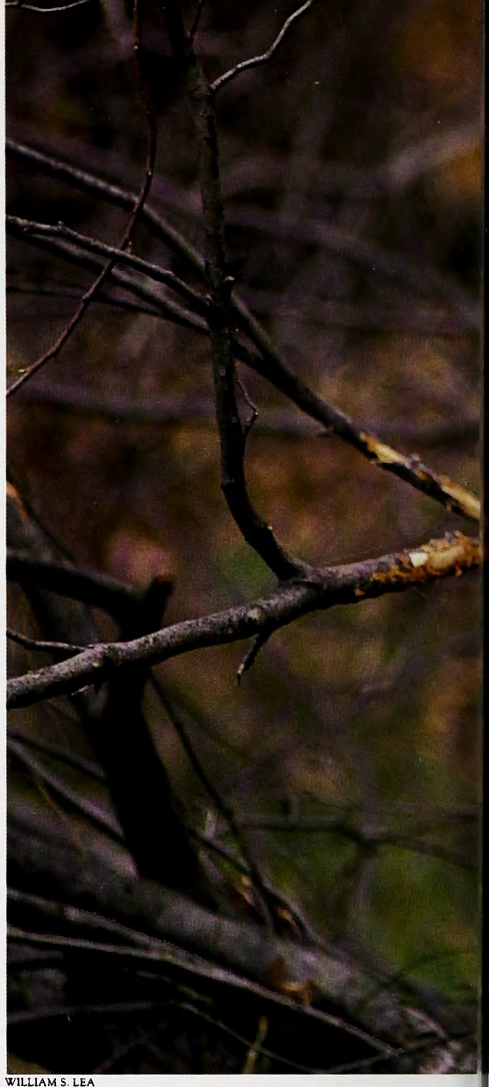
"I am skeptical of the usefulness of these pheromone scents," says Peter Bromley, extension specialist-in-charge with the North Carolina Cooperative Extension Service. "These scents degrade quickly once they've been removed from the animal, and there is no guarantee that they are actually collected in the manner in which they are advertised, and preserved in a manner that makes them useful."

But others swear by the old standbys, and point to heavy racks on living room walls as proof of urine- and pheromone-based scents. With those concerns as our caveat, let's take a look at deer scents—the old, the new, and the downright unbelievable.

Like good nutrition, scent aids can be broken down into four basic groups. Hunters in cow country have long known to step in cow piles while on the way to the blind. That same theory has given rise to a great multitude of *cover scents*, products designed to imbue a hunter or a hunter's clothing with an aroma that is non-alarming to deer. Today hunters in coastal thickets might opt for pine-scented cover scents, while Piedmont and mountain hunters might prefer earth scents, which are designed to make you smell like a dirt clod. (My wife cannot understand why I pay good money to smell like soil. What can I say?)

Perhaps the most popular cover scent is red fox urine, though one sporting goods owner I spoke with says coon cover scents are picking up in popularity. "Red foxes don't climb trees," explained a grinning Frank Ray, who with his father owns the One Stop Sport Shop in northern Wake County. Still, with all the choices around, many hunters choose *not* to choose. Instead, they take advantage of natural sources of cover scents. Some cut fresh cedar branches to store with hunting clothes in a plastic garbage bag, others rub persimmons over their boot soles. Such practices can be done with either natural or commercial scents. but many hunters feel the natural ingredient is, well, more natural, and bound to be better than one concocted in a laboratory.

Many hunters also use *attractor scents*, which are similar to cover scents in that they mask human odor. These are made from, or manufactured to simulate, forage foods. From apple to acorn, sweet corn, to peanut butter, chances are a food-based attractor scent is made that can be used in your particular hunting area. And that's the key with both attractor and cover scents. Whether using naturals or synthetics, masking scents or attractors, make sure the particular scent is common to your hunting grounds. Corn scent emanating from deep in a hardwood bottom may spook more deer than it attracts. (But peanut butter? Don't ask me.)



WILLIAM S. LEA

This doe is visiting a rub *made by a buck that scraped his antlers on a branch. When bucks detect a doe during breeding season, they will often follow her scent. To attract bucks, hunters use a number of scents that imitate does in estrus.*

Sex or *pheromone-based scents* are the ones that have come under the most intense scrutiny during the past few years. These urine-based scents are often called doe-in-heat or buck-in-rut scents, and are supposedly collected during the brief estrus for does or the longer rutting period for bucks. Artificially synthesized urine-based scents may hold their chemical compositions for a longer period of time, but as Bromley says, "It may still smell like urine to a hunter, but who knows what it smells like to a deer?"

Still, sex sells, and pheromone-based scents are among the most popular products on any well-stocked scent counter. According to Bob McGuire, a well-known deer researcher and scent manufacturer, the inherent curiosity of deer is what draws them in to the heavy ammonia smell of many sex scents. Of course, hunters who've killed deer over pre-estrus, post-estrus, peak estrus or rutting buck scents probably don't care what brought the deer from deep in the woods to the stand. But buyers, beware. Some question whether the application of these supposed scent wonders has actually been responsible for many downed bucks. Too many hunters count on scents of all types to cover up poor hunting technique.

The latest waves in the scent buying-frenzy are the *gland scents*, potions procured from the tarsal (or hock), metatarsal or interdigital glands. Pheromones released by these glands are a very effective, and very specific, means of communication between deer. In the past, hunters removed the glands from harvested animals and stored them for future use. Today, a wide variety of gland scents are available in a range of applications. You can even buy dried tarsal glands complete with hide and hair. (If you want to, that is.)

The specific communications associated with the differing glands are what makes them effective in the field. While many biologists are unsure how deer use scent from the metatarsal gland (located on the hind leg near the dewclaws), the tarsal gland suffers from no such lack of knowledge. Scent from the tarsal glands of both bucks and does, located on the inside of the deer's hind leg, intensifies during the breeding season, a fact lost on neither hunters nor scent manufacturers. Tarsal gland scents are used as sexual calling cards; deer urinate on the tarsal glands to create a pungent mixture of pheromones. The use of buck tarsal scents can act as an attractor during the rut, instigating aggressive behavior by bucks in a fighting mood. Doe tarsal scents are used to lure bucks with the promise of love.

A deer's interdigital glands are found between a deer's hoof, and are specific to individuals. Since deer are highly curious, many will follow a line of interdigital scent—right to the blind. But too much of a good thing is, of course, a bad thing. When a deer stomps its foot in alarm, it is depositing a heavier than normal dose of interdigital scent. Using too much of this kind of scent may keep deer away from your stand; hunting guides have used an overapplication of interdigital scent to alarm deer and flush them from cover and toward waiting hunters.

Choosing which scent to use is only one part of the scheme; delivering the goods is nearly as important. Sure, the old drag-a-rag

trick works, but that's like shooting with iron sights. What will your friend think? Besides, it's relatively free, so it can't be *really* effective, can it?

The notion of scent dispersal has been the basis for some of the most far-out hunting aids available, such as the slingshot-propelled time-release scent pellet known as the Scent Shuttle. Still, one of One Stop's best-selling scents is an item Frank Ray figured "would be just another play toy." Today, Hunter's Specialities' H.S. Scents wafers are many hunters' choice for a cover scent. The plastic cookie-sized pendants are impregnated with scent, and rejuvenate after each use. They're a no-mess, no-fuss breakthrough. "It just goes to show," Ray said, "you never can tell what people are going to buy."

But there are a few maxims to keep in mind when buying a scent aid dispersal system. While cover scents work well when dribbled on boot bottoms—or better yet, onto a device that attaches to the boot, such as Tink's Monster Scent Pad—some deer hunters refuse to apply sex or food attractor scents to their clothing. They'd rather the buck focus on a sapling or bush a few yards from the stand than wonder why the lovelorn doe seems to be floating in thin air.

Ease of operation and safeguarding against the inadvertent dispersal of buck-in-rut scent—such as on your car seat—has given rise to a variety of new products. The traditional 35mm film canister filled with cotton balls drenched in scent has lured in many a buck, and ruined many a good pair of pants. Try instead one of the new wick dispensers. Or try Dr. Juice Deer Block. It's a repellent made from human fatty acids and fear pheromes from deer glands that's used to funnel deer in a particular direction. Or perhaps a concotion called "X-rated and Censored." Sounds good, eh?

There really is no end to the scent-aid game, and a hunter could spend as much time and effort trying to figure out which is best as he ever did establishing good hunting technique. Remember our fictitious Nimrod? If you see yourself in the story line—smoking on the stand, washing your hunting duds in floral-scented detergent—you can't count on hunting scents to overcome such foolish mistakes.

Maybe you'd do just as well by concentrating on purging your own scent. Then, you might want to try these chlorophyll tablets, guaranteed make you smell clean from the inside out. Hey, the guys who make this stuff say it actually works! ⛝

STALKING
THE BUTCHER BIRD

The loggerhead shrike pins its victims on thorns and barbed wire, but the fate of these fascinating birds is also on the fence.

written and photographed by
Wayne Irvin

***The "butcher bird"** gets its nickname because of its habit of pinning its victims on barbed wire or thorns, much as a butcher might hang meat upon a wire in a storefront display. This helps the carnivorous bird hold and eat prey like this grasshopper (above) because, unlike hawks or owls, the small shrike lacks the powerful grasping talons of these larger raptors.*

Out of the corner of my eye, I caught a glimpse of Simon Thompson waving frantically, obviously trying to get my attention. He and I were in a field in Cleveland County about two and a half miles north of Polkville. I quickly crossed the field, and Simon excitedly pointed out his find. There, impaled on the barbed-wire fence, were more of the snails he had discovered and written me about earlier. It was what we'd been looking for, all right.

Those hapless snails were sure evidence that we were in the hunting territory of a loggerhead shrike, a bird also called the "butcher bird" because of its rather bizarre tactic of hanging all sorts of insects, small birds and rodents it kills on thorns or barbed wire much as a leopard might hang an impala it had killed in a tree.

Simon and I are always glad to see these little leftovers because we are involved in a challenging research project to conduct a census of shrikes in North Carolina and learn as much as possible about these birds and their habits here. Having found those impaled snails, we felt certain we would be able to find the bird that had placed them there. That meant we could add another shrike to the census, and we also had another bird to study.

My interest in shrikes began several years ago when I discovered two pairs of these unusual birds nesting within a mile of my home in Wake County. I began to visit the area and observe the birds' breeding activities. As a long-time naturalist and ornithologist, I became curious about the status, population and habits of these birds, and soon extended my search. Early in 1990, the North Carolina Wildlife Resources Commission provided research funds to enable me to finance and organize a project to carefully assess the numbers of shrikes currently breeding in our western Piedmont counties, and I enlisted the aid of Simon, who is another ornithologist.

Readers who have contributed a portion of their state income tax refunds to the wildlife tax checkoff earmarked for use in helping nongame, threatened and endangered wildlife species might like to know that this is one of the many carefully selected small grant studies being funded by their generosity. Those annual contributions are pooled in a fund, and grants are awarded to professionals to study and provide help for various wildlife species ranging from eagles and peregrine falcons to such lesser-known species as shrikes and salamanders.

The shrike is a particularly apt species for study because, like many nongame species, its numbers are decreasing in some parts of its range for reasons that are not fully understood. Though probably never abundant in North Carolina, it formerly ranged as far north as southeastern Canada. Today, biologists believe that shrikes rarely breed north of Virginia, and the birds are facing an uncertain future.

The loggerhead shrike (*Lanius ludovicianus*) is a member of a large and interesting group. It shares its unique habits with the 71 other members of the shrike family, which probably originated in the broad plains of central Africa, characterized by open country and thorny shrub thickets. As would be expected, the loggerhead shrike has similar preferences in habitat on this continent. Taking advantage of the drastic alterations imposed on eastern North America by man, this bird thrives in the artificial environment afforded by pastured tracts of open land, hedgerows of mature cedars, honeysuckle, shrubs and the occasional deciduous tree. The ubiquitious barbed-wire fence serves as a convenient perch and artificial source of the required thorns. Topping off the scene would be the appropriate number of cattle, horses or sheep to keep the grass cropped short, enabling the shrikes to see their prey.

The breeding biology of the loggerhead shrike is similar to that of familiar backyard birds. Nesting often begins earlier, however, with egg-laying underway as early as mid-March. A very durable nest is constructed, with a base often consisting of string and discarded rags or paper, making it conspicuous from below. Heavy twigs and rootlets form a sturdy second layer, with vegetable matter such as grass completing the cup. The nest is anchored to the supporting limb or vine very securely. The lining is fine, often of animal hair. Sheep's wool or cotton is used when available.

The female assumes the chore of incubating a normal clutch of five or six eggs, and the male provides her with most of the food she consumes during the 13 to 14 days required for the eggs to hatch. He vigorously defends the breeding territory which varies in size depending upon the availability of food. The newly-hatched young are brooded by the female, with the male responsible for feeding the whole family. When the young are feathered enough to maintain their body temperature, the female helps her mate secure food for the rapidly growing nestlings. The male then attends the fledged first brood while the female is incubating the second clutch of eggs. Curiously, the second nest is often placed at a higher elevation. The parents actively defend their nest or young against threats. Nesting activities are usually completed in North Carolina by the middle of July.

My studies indicate that nestling survival is comparable to other songbird species, which are not declining, and other investigators have reported similar results. The fact that nestling survival is adequate adds to the mystery of the decreasing numbers of this species.

Those remaining shrikes nesting in the Northeast and Northcentral states face an additional burden when they migrate to inhospitable wintering grounds where recent drastic changes in farming methods have severely reduced the availability of food items. Also, these northern migrants are faced with competition from the southern nonmigratory shrikes that defend the better feeding areas. There is good evidence that these negative factors have played a role in the drastic reduction in numbers of shrikes north of North Carolina.

***Loggerhead shrike populations** have declined precipitously across much of the nation. Since research shows that nestling survival (above) remains good, reasons for the decline remain mysterious.*

At this point, things become more complex. We've known for a long time that North Carolina represents a boundary, south of which shrikes are nonmigratory. The few remaining breeding shrikes north of us probably spend the colder months farther south, and those that survive the winter return to breed when days grow longer and they grow restless to migrate. We have not yet determined whether the majority of North Carolina shrikes are migratory, nonmigratory or something in-between. If it turns out that most of our shrikes are nonmigratory, then there's hope that the northern "shrike-crash" has progressed to, or is near, its southern limit. If, however, there are sufficient Yankee genes in our breeding shrikes, the future may be less rosy.

The North Carolina Museum of Natural Science is in the midst of a five-year Breeding Bird Survey of all bird species in North Carolina. Preliminary results suggest that breeding shrike numbers may be stable or slightly increasing. These surveys have located shrike nests in some counties where breeding was unknown, heretofore. There are certainly changes in the number of loggerhead shrikes breeding in North Carolina, but projections about their future without baseline data is very shaky science. In the meantime, one of the few management strategies for this species is the preservation of suitable undisturbed habitat wherever possible.

Shrikes are restricted to an all-protein diet. They eat insects, especially beetles and grasshoppers, small rodents, reptiles and birds whenever the opportunity arises. Their taste for small birds as food items may seem bizarre when one thinks of them as a small bird. Perhaps the most fascinating behavioral trait in shrikes is that of impaling their dead prey on thorns or barbed wire. Why do they do this? As a typical songbird, a shrike has a foot designed for perching. Unlike a hawk or owl, a shrike's foot cannot adequately grasp large food items such as a vole or young cotton rat. Prey, once caught, is quickly dispatched and carried in the beak to the appropriate site to be consumed. The thorn serves as a handy "tool" for holding the prey while the well-designed beak tears off a bite-sized portion. Typically, the entire animal is eaten and indigestible portions such as bone are regurgitated a few hours later. One cold January morning, I watched a shrike eat an entire impaled vole in less than 30 minutes!

The study area our team selected consists of 14 western Piedmont counties that we

***Habitat changes** are one possible reason shrike populations have declined in some regions. Pastures like this field in Wake County provide good habitat for shrikes, which need open grassy areas to effectively hunt in. Research to determine what is happening to shrike populations is important because the declines could indicate larger problems within an ecosystem.*

surveyed during the 1990 breeding season. We measured as many variables as possibly —nest elevation, choice of nest location (tree or shrub species), number of eggs or young, age of young and significant elements in the immediate environment that could possibly be relevant. One of the more exciting results of this study was discovering the relative abundance of shrikes within the study area. We found that shrikes are apparently nonexistent in the study area's northernmost counties of Stokes and Surry. Southward, things improved as we got into Iredell and Rowan Counties. Clearly, the winner was Cleveland County at the southern end of the study plot. There, we found 47 pairs of shrikes. This reveals an interesting population gradient, from north to south. While some shrikes within the study area were almost surely overlooked, we attempted to cover as much potential shrike habitat as possible.

While we were aware that shrikes have successfully adapted to an artificial environment resulting from man's drastic alteration of the eastern North American wilderness, during the 1990 survey we could also see changes in habitat that will surely create problems for this species. In Iredell and Rowan counties, thousands of acres have been devoted to the dairy and beef industries for decades, creating prime shrike habitat. Recently, however, many of these farms have fallen on hard times, resulting in legislation that makes it more profitable for cattlemen to sell their herds and avoid financial quagmires. We encountered an abundance of idle pasture acreage, with barns and other buildings in very poor repair. These areas still support a surprising number of breeding shrike pairs, despite the tall grass and invading shrubs. Still, we were left to wonder what numbers of shrikes these same areas supported a few years ago when conditions were more ideal. As this vegetational succession continues in these large fields, the number of breeding shrikes is likely to decrease further.

As it is with so many wildlife species, studying the loggerhead shrike is a lot like putting a jigsaw puzzle together. We're still examining pieces to see where they might fit or, in some cases, trying to find missing pieces. It's both fascinating and frustrating, but unless these puzzling biological factors can be understood, the future of yet another species may be in doubt. ☒

Who Cares For Wildlife?

You do, of course, and that's why you may like to know you can earmark a donation to specifically help nongame and endangered wildlife. Make your contribution directly or through the income tax checkoff to the Nongame & Endangered Wildlife Fund, N.C. Wildlife Resources Commission, 512 N. Salisbury St., Raleigh, N.C. 27604-1188.

NORTH CAROLINA NONGAME & ENDANGERED WILDLIFE FUND

Felines Are Efficient

Study Shows Free-Ranging Cats Are Major Predators

Written and Edited by Vic Venters

Cats kill wildlife, and a lot of it, too. That's what recent research conducted in rural Wisconsin confirms. The study was conducted on free-ranging cats by researchers at the University of Wisconsin. The results indicate cats could potentially be killing *hundreds of millions* of birds and small mammals every year in that state alone.

If those results are extrapolated across the United States, free-ranging cats could be responsible for killing perhaps billions of wildlife animals each year.

The study was conducted by collaring free-ranging cats with radio-transmitters that allow researchers to track their movements, behavior and hunting patterns. Free-ranging cats are defined as tame, semi-tame and/or feral domestic cats that are not restrained in their movements. The cats were monitored for their predatory penetration into blocks of wildlife habitat, especially around farms or rural households.

As in many states, many Wisconsin farmers and rural residents keep or feed one or more cats around their property for pest control. About 80 percent of rural residents keep cats and many allow their felines to range at will or only partially confine them. The average number of cats is about 4.6 per farm per household. Previous studies have indicated that free-ranging cats are able to catch and kill between 100 to 1,000 prey animals per year per cat. When multiplied by the estimated 1 million free-ranging cats in Wisconsin, the magnitude of cat predation on wildlife becomes apparent.

Domestic cats can be one of the worst predators for several reasons. They are effective hunters that kill even if they aren't hungry. More important, they are subsidized predators, meaning they are often fed by owners so that they live and continue to hunt regardless of the status of prey populations. Natural predators in the wild will starve or find better territory if prey populations decline, thereby maintaining a natural system of checks and balances between predator and prey populations. But free-ranging cats don't operate under these rules; they hunt through thick or thin.

"The problem of free-ranging domestic cats as an introduced predator is particularly severe because their numbers are kept artificially high by supplemental feeding," the researchers report. "(Since) cats are known to capture prey despite supplemental feeding, the large number of cats maintained by humans feed on prey populations even when these (prey) populations are very low."

Concerns about declining bird and mammal populations sparked the study. "Songbirds and small mammals make up a large proportion of free-ranging cats' food," the report stated. "Many species of both forest and grassland nesting songbirds have declined in the Midwest. Destruction of nesting habitat in North America and wintering habitat in Central America have been suggested as possible causes, as has the introduction of exotic predators. In some regions of the United States, introduced predators such as domestic cats have been known to severely deplete and in some instances extirpate songbird and small mammal populations.

MELISSA McGAW

Killer Cat: *A recent study in Wisconsin indicates that domestic free-ranging cats kill hundreds of millions of wildlife animals each year in that state alone. Because they are introduced predators, free-ranging cats can affect native wildlife populations.*

"Not only do cats prey on songbirds and small mammals (they) also take important game species such as cottontail rabbits, pheasant and quail," researchers reported. "Because of these animal's larger size, most cat predation occurs on immature individuals and therefore peaks during the reproductive season." The study showed that birds made up about 25 percent of the cats' kill, with small mammals being the most commonly killed prey. Across the United States—including North Carolina—wildlife biologists have recently been taking a closer look at how predation affects prey wildlife populations.

While there have been no similar studies performed on free-ranging cats in North Carolina, wildlife biologists have long maintained that free-ranging felines can be substantial predators of wildlife on farms and in the rural countryside. "There's no doubt that if you've got a lot of cats running around, they are going to prey on your quail or other bird species," said Terry Sharpe, small game biologist for the Wildlife Resources Commission. "People keep them for pest control, but they kill a lot more than just pests."

Free-ranging cats could be an international problem. In Britain, another cat predation study produced similar results. "Domestic cats kill at least 20 million birds a year in Britain," the British authors wrote. "Yet we are supposed to be a nation of bird lovers, many of whom keep cats but still castigate bird hunters and trappers on the continent of Europe."

Coming to N.C. State Fair

Dinosaur Exhibit Features Life-like Reptiles

For the first time in at least 60 million years, dinosaurs will again stalk the Piedmont of North Carolina.

Well, sort of.

This month, nine life-like dinosaur replicas will make an appearance at the North Carolina State Fair in Raleigh. Visitors will be able to see the vicious, toothy grin of a *Tyrannosaurus*, hear the roar of a *Stegosaurus* and watch a *Apatosaurus* use its long tail like a whip.

The life-sized dinosaur replicas, known as "Dinosaurs Alive," are products of Dinamation International Corporation of California. Their anatomically correct replicas—some 17 feet high and 50 feet long—feature motorized parts to show viewers the way the ancient reptiles might have moved, acted or sounded. The dinosaurs will be coming to the N.C. State Fair for the first time Oct. 18-27. The dinosaur exhibit is being sponsored by the N.C. Museum of Natural Sciences and money raised at the fair will go to help purchase new exhibits and help the expansion of the museum.

Dinamation's dinosaurs appeared at the Smithsonian Institution this year and have been wildly popular. A dinosaur exhibit attracted 200,000 people to the World Trade Center in Boston and an estimated 30 million people have seen the dinosaurs worldwide.

Other dinosaur replicas at the exhibit will be: *Triceratops*, the three-horned nemesis of carnivorous dinosaurs; *Pteranodon*, one of the largest flying creatures ever; and *Parasaurolophus*, a duckbilled dinosaur featuring a 6-foot elongated crest. "It's an exciting addition to the fair's attractions that will interest and fascinate people of all ages," said N.C. Commissioner of Agriculture Jim Graham.

The N.C. Museum of Natural Sciences will use part of the funds that are raised to finance a dinosaur retrieval mission in Wyoming. Under the tutelage of noted paleontologist Dr. Robert Bakker, North Carolinians have been excavating real dinosaurs and bringing the bones back to the museum. Several large bones from a *Cetiosaur* are being excavated by museum volunteers. A living fossil laboratory has been constructed in the museum so that the study and preparation of the fossils can be done in public with participation by volunteers. Ultimately, the project hopes to create full dinosaur skeletons for the museum's planned fossil hall.

Tickets for school groups will be available at a discount. For more information, contact the N.C. Museum of Natural Sciences in Raleigh at (919) 733-7450.

N.C. MUSEUM OF NATURAL SCIENCES

Dinosaurs Alive: *Nine life-sized replicas of dinosaurs will make an appearance at the N.C. State Fair in Raleigh this October. The replicas, like this fearsome* Tyrannosaurus, *are anatomically correct and will feature life-like moves and sounds. Proceeds from the exhibit will go to benefit the N.C. Museum of Natural Sciences and its dinosaur research and exhibits.*

Record Spring Turkey Harvest

For the eighth year in a row, North Carolina turkey hunters set a new harvest record. For the 1991 spring gobbler season, hunters bagged a reported 1,820 birds. This year's harvest was 19 percent higher than last year's reported harvest of 1,524 wild turkeys.

The coastal region's harvest of 145 birds was down 7 percent from last year's harvest of 156 birds. Flood conditions along the Roanoke River and a lack of hunting on Camp Lejeune Marine Corp Base due to the Gulf War contributed to the decrease. However, both the central region's and western region's harvests were up significantly. The central region's harvest of 744 birds was up 16 percent over last year's harvest of 643 birds, while the western region's harvest of 931 birds is up 27 percent over last year's harvest of 735 birds.

Wild turkey populations continue to climb in North Carolina. For instance, the estimated population in 1980 was approximately 8,000 birds. In 1985, the estimated population was 14,000 birds and in 1990 the estimate was 28,000 birds. A successful restoration program coupled with several good years of reproduction are responsible for these dramatic increases.

Since 1970, over 2,000 wild turkeys have been live-trapped and relocated to restoration areas across the state. Since over 1,000 of these birds have been relocated in the last five years to areas that are not yet open to hunting, the upward trend in both population levels and harvests is expected to continue for many more years.

—Michael H. Seamster
Wild Turkey Project Leader

Tips Will Help Shooting

Non-toxic Steel Shot Mandatory This Year for Waterfowl Hunting

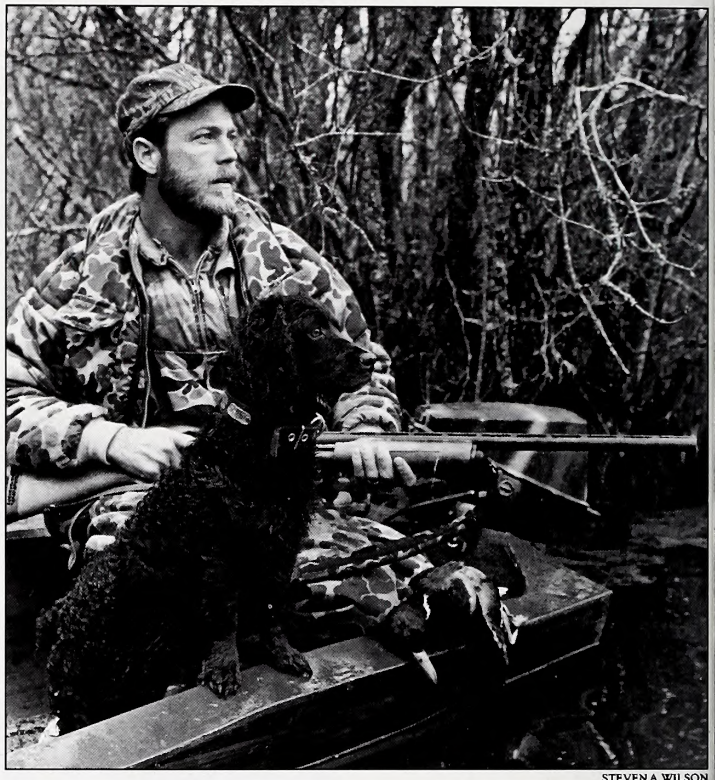
It's finally here. Non-toxic steel shot. For use by waterfowlers—everywhere. Beginning with this 1991-92 hunting season, all waterfowlers in the United States must use steel shot when hunting ducks or geese. Last season was the final year lead shot was allowed under a five-year phaseout plan.

If all goes as planned, the mandatory nationwide use of steel shot will begin to close the door on waterfowl lead poisoning caused by the birds' ingestion of lead shot. It's estimated that millions of waterfowl die each year because of lead poisoning. Endangered species such as bald eagles have also been documented as dying after eating lead-poisoned ducks. Unfortunately, the lead shot that now litters the bottom of many marshes and ponds will continue killing for some time, as waterfowl continue to root up and ingest it. Eventually, however, it's hoped that lead shot will be buried under debris and ingestion by waterfowl will become rarer with each passing year.

Now that it's mandatory everywhere, many waterfowlers who have avoided steel shot will have to learn to shoot it. Steel is somewhat more difficult to shoot than lead because of its inherently tighter patterns and shorter shot strings. Because steel is lighter than lead, steel pellets that are the same size as lead also do not have the same killing power.

Until ammo makers develop a cheap and effective non-toxic shot alternative, hunters are going to have to use steel. Following these tips will help you shoot better. Experts advise:

- Use steel shot two sizes larger than the lead shot size you previously used. For instance, if you normally shot lead 4s, go to steel 2s.
- Experts are divided on the best choke, but modified or improved cylinder are good choices for shooting over decoying ducks. Full chokes aren't necessary over decoys since steel shoots tighter patterns.
- Pass up long shots. Steel loses its killing power at longer ranges relative to lead because it's lighter. Keep your shots in closer range—35 yards or less is ideal.
- Use the same forward allowance as you would with lead shot. In the past, some experts advised shortening your lead at close ranges or lengthening your lead at longer ranges because steel travels faster than lead at close ranges and slower at longer ranges. Ballistics tests and experience have proven, however, that the air-speed differences are negligible. It's best to stick with the lead you've used before.
- Improve your hunting techniques. Learn to call properly, use camouflage and build better blinds. You may have to work harder to get ducks in close, but you'll cripple fewer birds.
- Most experts advise against shooting steel shot in vintage shotguns, especially thin-barreled doubles. If you like your old duck gun, an alternative to retiring it is having sleeves or screw-in chokes fitted to it. Have a gunsmith check your shotgun if you have any questions about shooting it with steel.
- In addition to being necessary for hunting waterfowl in the wild, non-toxic shot will also be mandatory for shooting captive-reared ducks on shooting preserves, in field trials and during bona fide dog training activities.



STEVEN A. WILSON

Steel Yourself: *This year, waterfowlers across the nation and North Carolina will have to shoot non-toxic steel shot everywhere they hunt ducks or geese. The nationwide use of steel shot will greatly reduce lead poisoning among waterfowl.*

Deadline Next Month

Take Pride In America

The official 1991 Take Pride in America (TPIA) awards applications are now available from North Carolina's Take Pride In America office.

The state and national TPIA Awards Program recognizes individuals and groups for outstanding stewardship projects or awareness efforts involving federal, state, local and native American resources. These resources include lands, water and cultural resources. Nomination activities must have started, finished or been on-going in 1990 or 1991.

Applicants must submit nominations to the state TPIA office postmarked no later than November 1, 1991. Nominees will be eligible for both the state and national awards. National winners will receive their awards at a ceremony to be scheduled in Washington, D.C. State winners will be honored at the Governor's Mansion in Raleigh. For an application or information, write Take Pride In America, Division of Parks and Recreation, Archdale Building, P.O. Box 27687, Raleigh, N.C. 27611.

Calendar

On several occasions, events in this calendar have been changed or canceled without notice. Readers should check the contact before traveling to an event. Listings for the calendar should be sent at least four months in advance.

Oct. 1 to Nov. 1

Nature art exhibition and sale at CP&L's Harris Visitor's Center at New Hill. The exhibit is sponsored by the N.C. Nature Artists Association and CP&L, it features art of native plants and wildlife. For more information, contact the Harris Visitor's Center, Route 1, Box 327, New Hill, NC 27562.

Oct. 12

The 1991 annual meeting of the Albemarle-Pamlico Estuarine Study in downtown Manteo will feature a street festival entitled "Sound Solutions." The festivities will include exhibits, panel discussions, children's activities, field trips, educational programs, seafood booths and entertainment. For more information, contact the N.C. Coastal Federation, Hadnot Creek Farm, 3223-4 Highway 58, Swansboro, N.C. 28584.

Nov. 2

The N.C. Herpetological Society will hold its annual fall meeting on the campus of N.C. State University in Raleigh. All persons interested in reptiles or amphibians are welcome. For more information, contact the N.C. Herpetological Society, N.C. State Museum of Natural Sciences, P.O. Box 27647, Raleigh, NC. 27611.

Field Notes

Dove (first season)	Closes Oct. 5
Rails, Gallinules and Moorhens	Closes Nov. 9
Eastern Bow and Arrow Deer	Closes Oct. 5
Western Bow and Arrow Deer	Closes Oct. 5 Reopens Oct. 14-Nov. 23
Central Bow and Arrow deer	Closes Nov. 9
Northwestern Bow and Arrow Deer	Closes Nov. 16
Eastern Muzzleloading Deer	Oct. 7-Oct. 12
Western Muzzleloading Deer	Oct. 7 -Oct. 12
Eastern Gun Deer	Opens Oct. 14
Wild Boar (first season)	Opens Oct. 14
Black Bear	See *Regulations Digest*
Raccoon and Opossum	See *Regulations Digest*
Crow	See *Regulations Digest*
Gray Squirrel	Opens Oct. 14
Fox Squirrel (only in 18 counties)	See *Regulations Digest*
Ruffed Grouse	Opens Oct. 14
Fox	See *Regulations Digest*
Groundhog	No closed season

Information on bag limits, either-sex hunts and other regulations may be found in the *1991-92 North Carolina Inland Fishing, Hunting & Trapping Regulations Digest*. Migratory waterfowl regulations were unavailable at press time. Check with license agents or contact the N.C. Wildlife Resources Commission after Oct. 1, 1991.

The 1992 North Carolina Wildlife Calendar Is Here!

***With such artwork** as Bob Henley's "Mischief in the Making" featured above, the North Carolina Wildlife Calendar is sure to sell out again this year.*

The works of Robert C. Flowers, Jr., Janet Allen Walker, David E. Doss, Patsy McAuley, Bob Henley, Bob Herr, Duane Raver, Larry Barton, Walt Obman, James A. Brooks, Joe Seme, and Bob Timberlake are featured in the 1992 Wildlife Calendar. Order yours today by returning the form below with your check or money order to 1992 Calendar, N.C. Wildlife Resources Commission, 512 N. Salisbury Street, Raleigh, NC 27604-1188.

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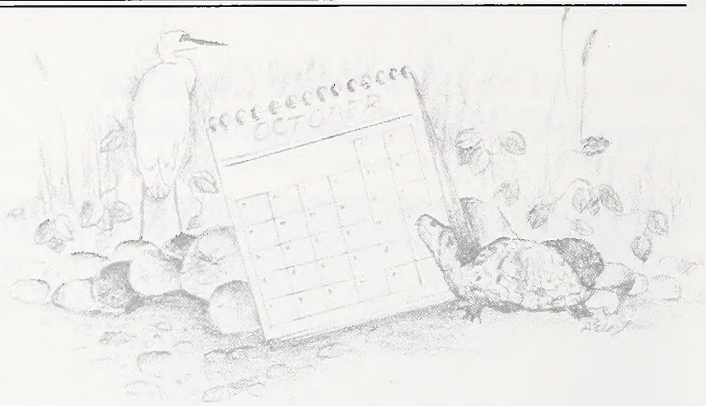


Can Your Dog Catch Rabies?

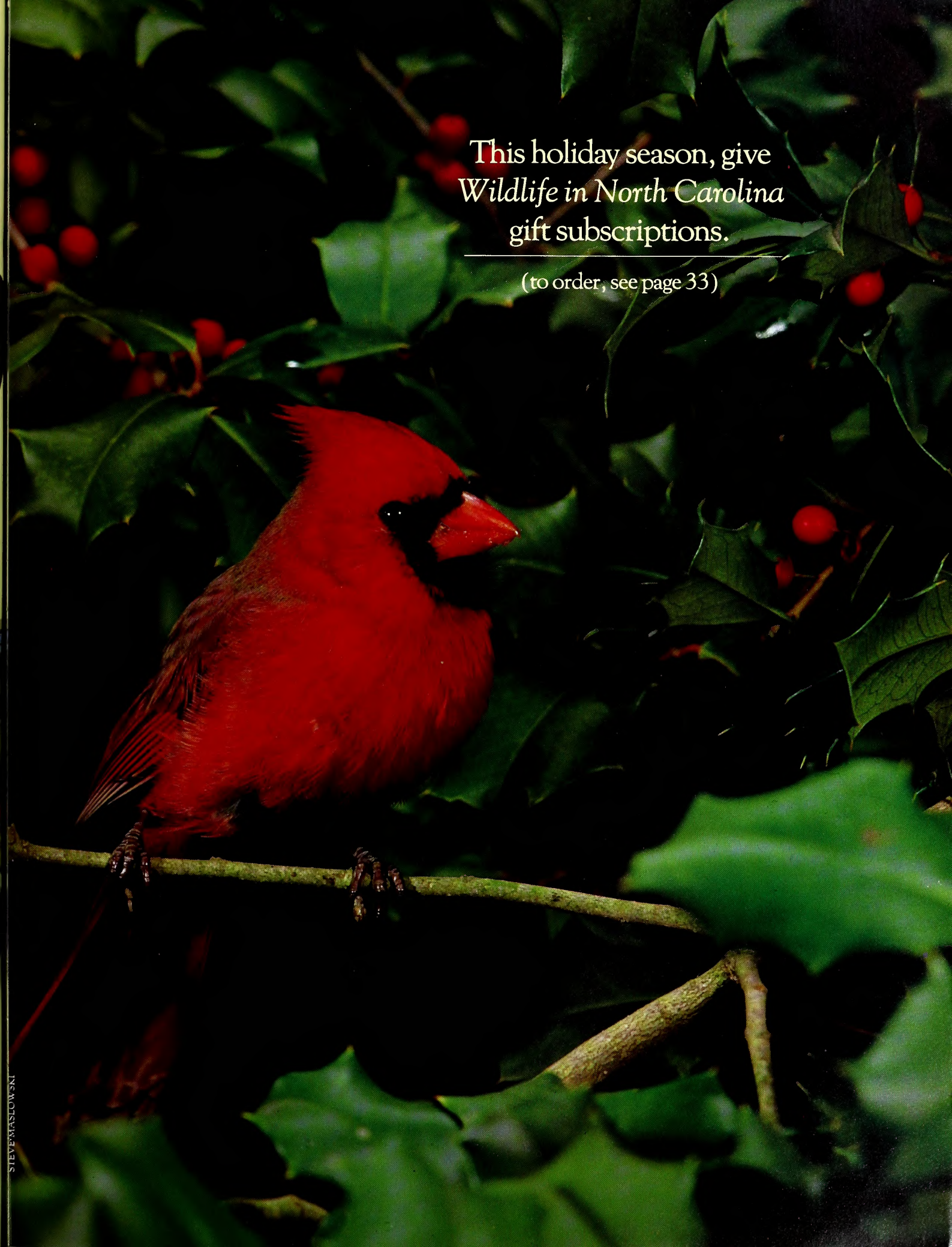
by Vic Venters

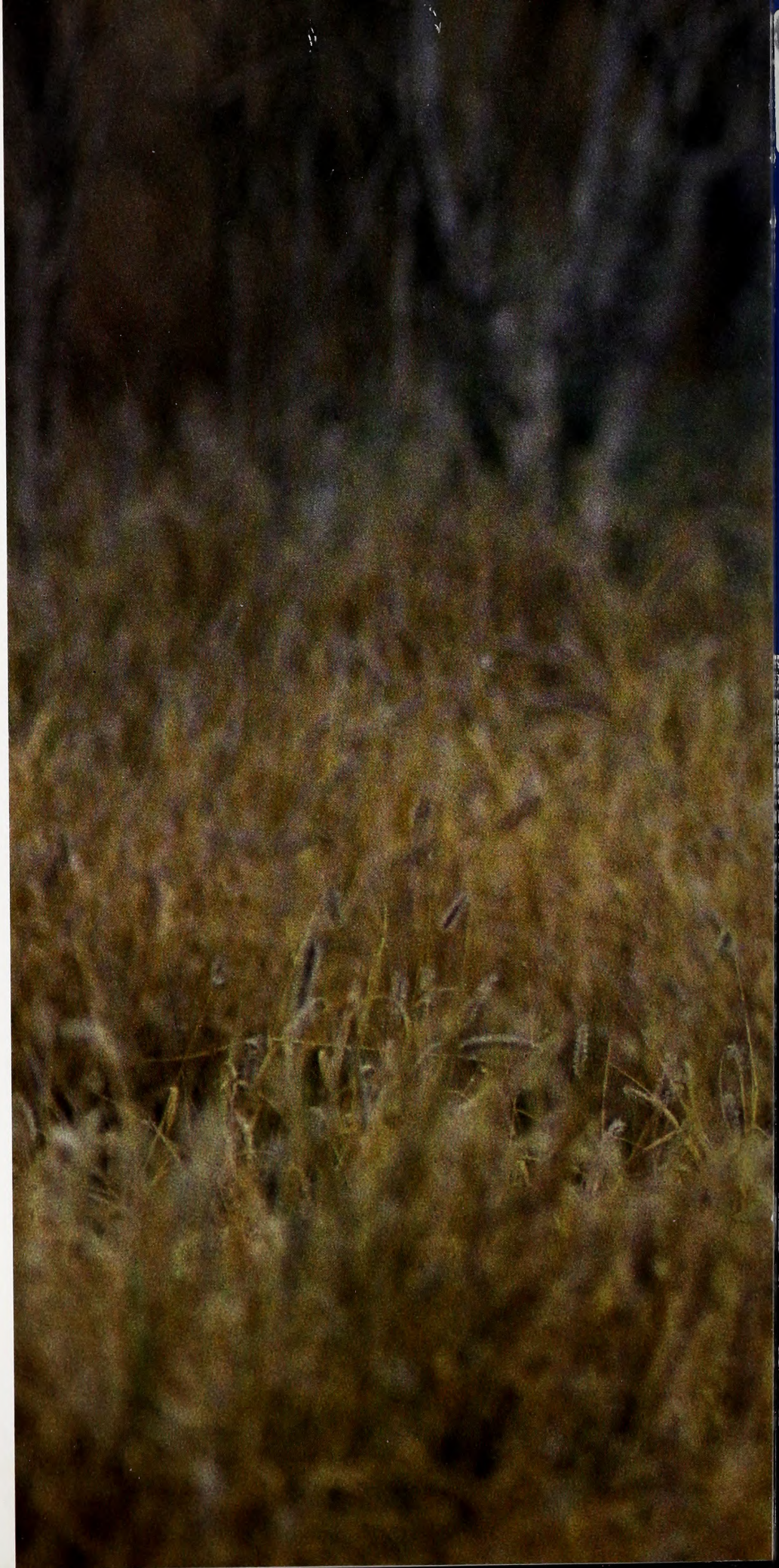
Hunting season is here at last! Before you take your prize hunting dog into the woods, however, you'd be well advised to follow our first tip. Besides, it's the law.

Rabid Raccoons: With a rabies epidemic now facing northeastern North Carolina, be sure to vaccinate your dogs or cats. If the past is any indication, the disease could spread. Rabid raccoons are the main carriers of the current rabies epidemic, and health officials are urging owners to double check their pets. Sportsmen should be especially diligent since their dogs have a higher chance of encountering a rabid raccoon, skunk or fox in the woods. While all pets must be vaccinated by state law, some dog and cat owners have grown complacent in recent years as rabies has become uncommon. However, unvaccinated pets that are bitten by a proven or suspected rabid animal must be destroyed. For instance, if a rabid raccoon was found in a dog pen, all the dogs in the pen would have to be destroyed unless they were legally vaccinated. Each county holds low cost vaccination clinics every year. Many veterinarians are willing to hold a vaccination clinic at a hunt club or another location. Only those rabies vaccinations given by a veterinarian are legal. Remember, the disease can kill if you or a member of your family is bitten by a rabid pet. The cost of prevention is far overshadowed by the loss of a favorite pet or your child.

Full of Fish: Your new pond will be ready for stocking with sunfish or channel catfish in October or November. Largemouth bass should not be stocked until next June, allowing the sunfish to grow over the coming winter and spring so that they can spawn before the bass can eat them. The best sunfish species for small pond stocking are bluegills or shellcrackers. Contact the Wildlife Commission's Division of Inland Fisheries at (919) 733-3633 for more information.

Bird Food: As the weather grows colder, song birds' food and energy needs increase. If you've discontinued bird feeding during the summer, you'll want to begin feeding again this fall. October is a good month to set up so that birds will be able to easily locate the feeder when cold weather arrives.


This holiday season, give
Wildlife in North Carolina
gift subscriptions.
(to order, see page 33)
STEVE MASLOWSKI



Interrupted Nap

Even the biggest bucks have to find a soft spot in an overgrown field and take a rest now and then, but there's always time for a handsome fellow like this to pose for a portrait.

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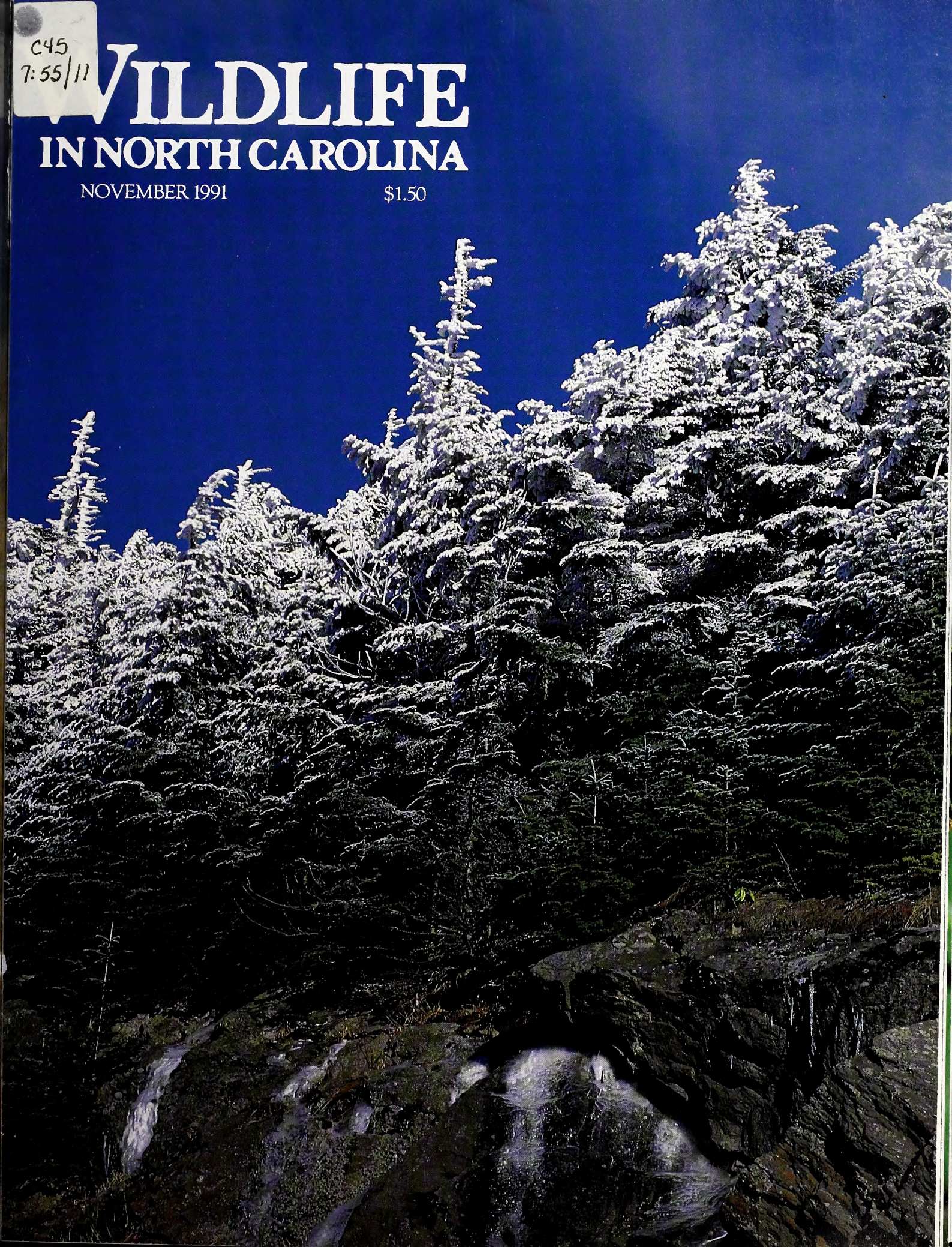

Getting Lost and Loving It

by Jim Dean

The last time I got lost, it was on the off ramp of a giant cloverleaf where I pulled out of bumper-to-bumper traffic with my emergency lights blinking and sat studying a map while considerate drivers honked their horns and gave me hand signals to show their sympathy. I eventually had to ask directions before I was comfortably assured I was on the right path again. This particular brand of lost happens to me so often that I no longer measure distance in miles, but in "asks." It's far more accurate. For example, Washington, D.C., is only four asks from Raleigh, but I've had some six-ask trips just getting across town.

Being lost in the woods is quite a different matter. For one thing, it's nowhere near as dangerous, and there's no one around to share in your wonderment. Indeed, I've come to cherish my considerable ability to lose my bearings. These days, with wilderness drying up everywhere, the feeling of not quite knowing where you are in the woods is rather pleasurable, at least at the outset. I tend to hold with Robert Ruark who said "If you don't care where you are, you ain't lost."

ILLUSTRATED BY JACKIE PITTMAN

If that fails to assuage any growing apprehension, I find it helpful to recall that even Daniel Boone denied that he was ever truly lost, commenting only that he was once "a mite confused for six weeks."

The truth is that I have been lost in the classic sense only once that I recall. I had hiked a faint and unfamiliar 3-mile trail into a remote trout stream in western North Carolina. Upon reaching the creek, I stopped to familiarize myself with the rock patterns, then hiked downstream. I planned to fish back to that spot, then climb the trail to the car.

I tend to get a bit engrossed when I'm fishing—imagine that—and as luck would have it, I fished well past my stopping place. Shortly after sunset, I quit fishing thinking that the trail was still upstream. After a 20-minute hike, I figured I must have walked past the trail without recognizing it. I turned around, and walked briskly for 30 minutes without seeing anything familiar—or rather anything unfamiliar.

By the time it was dusk, I had pretty much tromped out a mile of new trail up and down the creek. Ruark notwithstanding, I was beginning to care where I was. At that point, I did what I should have done to begin with. I sat down and gave the matter some thought. I still wasn't convinced that I had fished past the trail, but the upstream route seemed a poor bet. By heading downstream, I knew I would either pass the trail and recognize it, or eventually reach some form of civilization between me and the Atlantic Ocean. If I wasn't out by full dark, I'd simply make camp and spend the night. It was too dangerous to walk those rhododendron slicks and outcrops at night. I was already recalling my Boy Scout handbook instructions for making friction fires, lean-tos and beds of hemlock when I crossed the trail a scant few yards from where I'd been sitting. I was almost disappointed.

Since that time, I've carried a simple survival kit when fishing or hunting. Having it is good insurance and gives me a sense of self-sufficiency. Of course, no one wants to lug 10-pounds of insurance all day, but if you consider what you can't live without, you can make do with far less.

My survival kit includes a folding jackknife, a disposable butane lighter and a small penlight—all lightweight items I'm likely to use anyway. In addition, I carry a disposable plastic, blaze-orange poncho that folds up to about the size of a pack of cigarettes. It will provide some warmth and shelter, and it's also visible to searchers, an important feature if you happen to break an ankle. One of those thin, space-age tarps with reflecting Mylar on one side will provide more warmth and protection, but it's a bit heavier. I also carry a police whistle. There's a limit to how long and loud you can holler if you're lost or hurt.

Some might want more first-aid items, a snakebite kit, water purification tablets, a couple of granola bars, bouillon cubes, waterproof matches or a compass, but you've got to cut weight somewhere so I add these items only when I think I might need them. You've already got hooks or bullets in case you need to roast a trout or a starling. I almost forgot the most important thing—a small zip-lock bag of coffee. Your pot is the empty drink can left over from lunch, a more than adequate vessel for building a passable cup of coffee.

I figure if I spend the night out there, I'm certainly not going to deprive myself of a hot cup of Columbian the next morning. Who knows, my rescuers may bring a newspaper.

November, 1991
Volume 55, Number 11

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WILDLIFE IN NORTH CAROLINA

Wildlife in North Carolina is the official educational publication of the North Carolina Wildlife Resources Commission and is dedicated to the sound conservation of the State's wildlife and other interrelated natural resources.

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Wildlife Through the Year *by Vic Venters*

Cover *The rare spruce-fir forest shown here on Mt. Mitchell was threatened by logging 75 years ago, and concern over its loss led to the establishment of North Carolina's state parks system. Photograph by Ken Taylor.*

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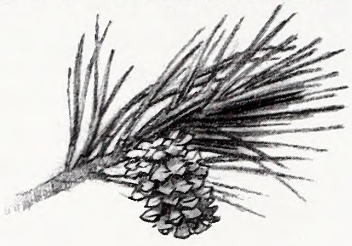
Pines are among several kinds *of conifers that grow in North Carolina—cypresses, spruces, firs and cedars are others. Hardwood trees can be fertilized by insects, birds or the wind, but conifers rely on the wind to carry pollen from cone to cone. Conifers are more primitive than flowering plants, but flourish throughout the state.*

new female cone

last year's female cone



Loblolly pine
(Coastal Plain, Piedmont)

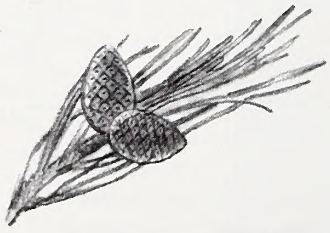
Shortleaf pine
(statewide)

Pitch pine
(Mountains, adjacent Piedmont)

Eastern white pine
(Mountains, adjacent Piedmont)

Longleaf pine
(Coastal Plain, Piedmont)

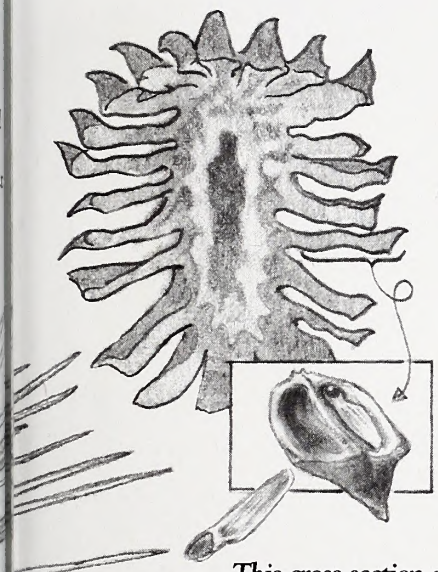
Virginia pine
(Piedmont, Mountains)



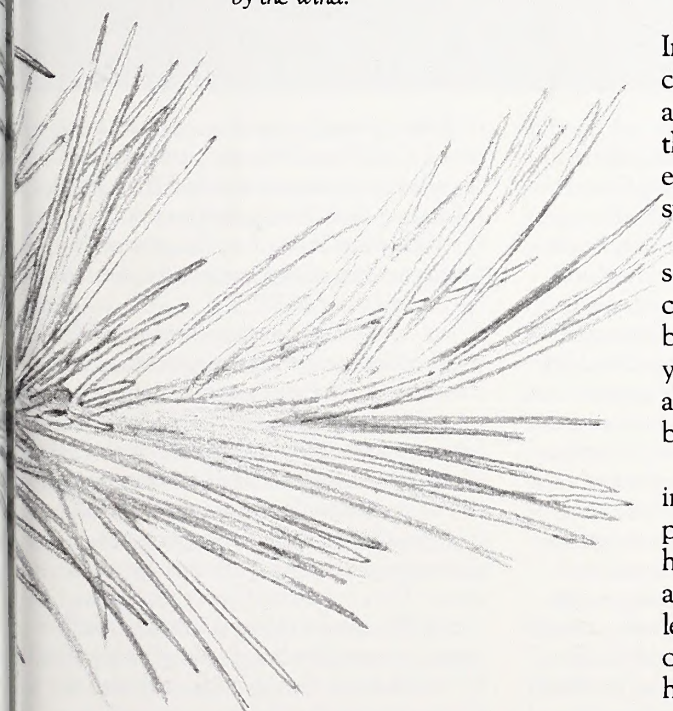
Pond pine
(Coastal Plain)

Table Mountain pine
(Mountains, adjacent Piedmont)

North Carolina has eight *native pine trees. Each tree's cones differ in size and shape. Pine needles are usually found in bunches of two to three, although the white pine's needles are gathered in groups of five.*



This cross section *of a female pine cone shows that it consists of a series of tightly bunched scales. Two fertilized seeds develop on each scale, and when the cone is mature the scales separate and the winged seeds are blown away by the wind.*



Pines have two kinds of cones, *males and females. Male cones produce pollen and are smaller than female cones. The male cones develop at the base of the current year's growth. New female cones grow toward the end of the new shoot. Female pine cones take two years to mature.*

The Long Story of Conifers

written by Lawrence S. Earley / illustrated by David Williams

Botanists tell us that when conifers appeared on earth about 300 million years ago they represented an advance over earlier plants. That's because they reproduced by seed, not by spores like the ferns. Much later the flowering plants (a group that includes our familiar flowering trees) left conifers in the dust, so to speak, when they enclosed their seeds within a protective coating and got insects—rather than the wind—to do the work of fertilization.

Hardly defeated, North Carolina's conifers—cedars, cypresses, firs, spruces and, of course, pines—are among the hardiest of our trees, thriving where little else will. The baldcypress likes flooded swamps; longleaf pine grows nearly alone on desert-like sand ridges; and on Arctic-like mountain peaks you'll find Fraser fir.

Conifers are gymnosperms, a word formed from Latin and Greek words that mean "naked seed." Botanically, this refers to the fact that conifer seeds lack the protective coating of an ovary. More simply, it means that conifers don't have flowers or fruits as do the true flowering plants (angiosperms). Instead, conifers bear their reproductive parts in male and female cones. In fact the word conifer means "cone-bearing."

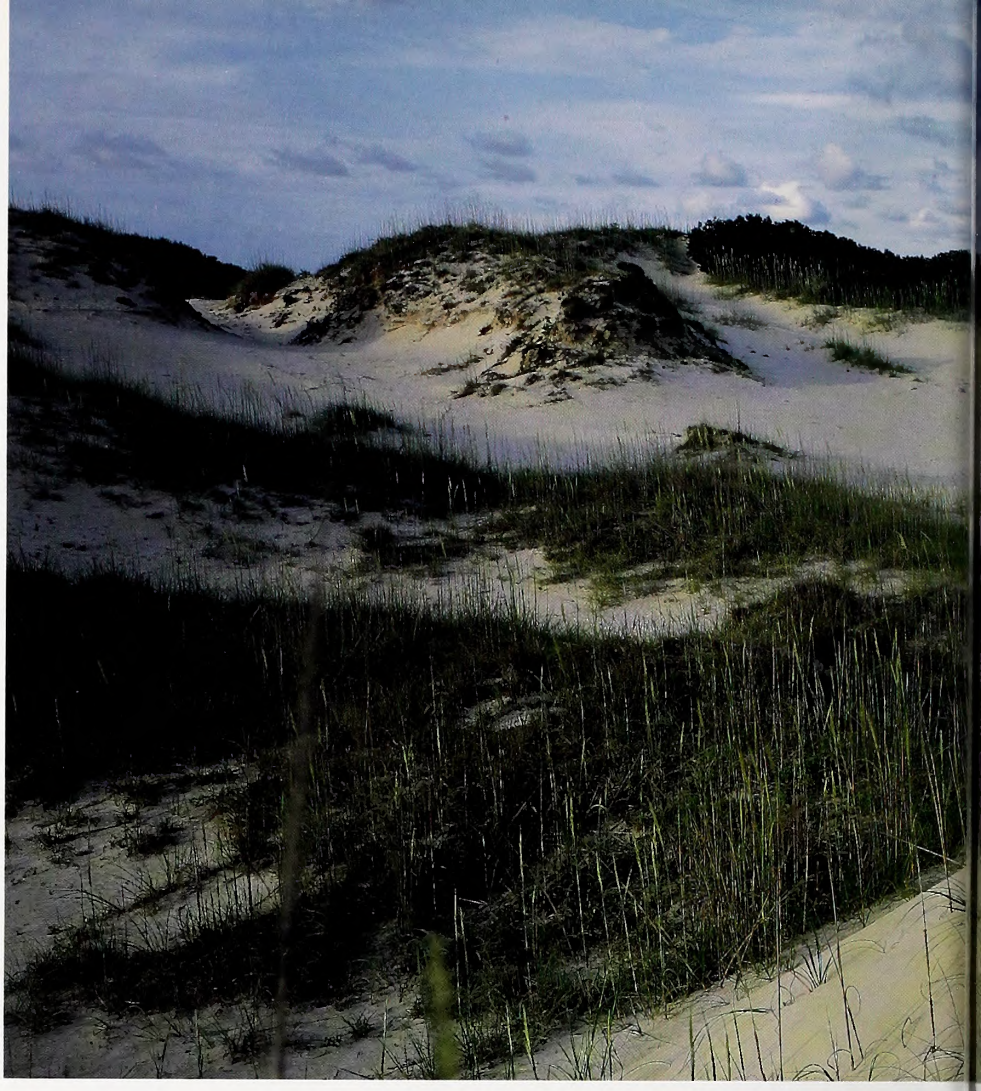
Pine seeds develop within the tightly bunched scales of female cones. In spring, pollination takes place when wind-blown pollen from male cones on one tree lodge beneath the scales of the new female cones on another tree. The pine seeds take about two years to mature and when they are ripe, the cones of most species open and the seeds, each equipped with a "wing," are blown away by the wind. Among some species, heat from fires is needed to open cones.

Wind-aided pollination is more haphazard than pollination by bees, so conifers have to make a lot of pollen. It's estimated that each male pine cone produces between 1 and 2 million grains of pollen. Each cone has between 60 and 120 seeds, and each tree may bear hundreds of cones per year, although the actual number can vary from individual to individual and from species to species. For example, longleaf pines may produce a bumper crop of cones one year, and none the next.

Conifer leaves don't look at all like leaves from broadleaved trees, yet in general they function in the same way. Like a maple leaf, a pine needle produces food for itself by photosynthesis. Also like a maple leaf, needles have minute pores through which water vapor escapes, a process known as "transpiration." Maples, oaks and other broadleaved trees drop their leaves in autumn so they don't lose all their water during the frozen days of winter. But because narrow pine needles transpire less water, pines have less need to drop all their needles seasonally.

This doesn't mean that pines aren't deciduous. In fact, all conifers drop their needles—they just don't drop them all at once. Look into the interior of a pine tree right now and you'll see many needles turning brown. Pine needles generally remain on a tree for two or three years before they fall off, the old ones first.

Conifers have less value for wildlife than the flowering plants whose berries, nuts and acorns are critical components of wildlife diets. Yet pines do provide nesting and denning habitat for wildlife, and their seeds are eaten by small mammals and birds.



A Legacy In Waiting

As the state celebrates the 75th anniversary of its parks system, the challenge remains to make good on the original promise.

by Donald G. Reuter

Under a star-filled night sky last summer a small group of children and adults made their way across the beach at Bear Island, a remote state park in Onslow County. Most campers had already settled down for the night, but for this group, led by a park intern, the night was just beginning. Moving cautiously, they gathered behind a large form on the beach and watched as the sea turtle laid her eggs. Following ancient urges, the loggerhead had returned to this barren beach to nest, and her return was noted with excitement. "Look at how many eggs she's laying!" whispered a young boy loudly.

One of the few remaining unspoiled barrier islands on the East Coast, Bear Island is a primary nesting area for the endangered sea turtle. But for many North Carolinians, it has also been an invaluable outdoor classroom where nature's sometimes harsh lessons have been observed.

"After witnessing a giant loggerhead sea turtle nest on Bear Island, park visitors begin to realize that the park is not only an important place for humans, but is vital to the wildlife which need it for survival," says Sam Bland, Hammocks Beach State Park Superintendent and 10-year veteran of the N.C. Division of Parks and Recreation. "Our educational programs make people realize the hazards sea turtles must overcome to survive—that's why they lay all those eggs, because only a few will survive. That's when they can appreciate the importance of the primitive aspects of Bear Island."

North Carolina's state parks system, 75 years old this year, has been offering this kind of educational experience to hundreds of thousands of Tar Heels over the years. But its diamond anniversary is being celebrated at a time when parks lovers are dismayed by the sad disrepair of many of their parks. Crumbling buildings, eroded trails and a lengthy list of needs have outpaced a scaled-back budget, and who can say whether the state can fulfill the lofty mission defined for its parks system in the 1987 State Parks Act: "to promote understanding of and pride in the natural heritage of this state"?

Ironically, it was a case of widespread public discontent that prompted the formation of the state parks system three-quarters of a century ago. In the early 1900s, logging was destroying Mount Mitchell, the highest peak east of the Mississippi River. When the magnificent forests of the mile-high peak fell to the lumberman's axe, alarmed citizens began to voice their concerns. They contacted Governor Locke Craig who went to Mount Mitchell and witnessed the exploitation firsthand. Horrified by what he saw, Gov. Craig convinced the loggers to stop their operations until he could meet the General Assembly.

Upon his return to Raleigh, the governor began a campaign to save Mount Mitchell. He joined with individuals and organizations to make the area a state park. On March 3, 1915, the General Assembly passed a bill establishing Mount Mitchell as North Carolina's first state park, and, incidentally, the first state park in the Southeast. The first

KEN TAYLOR

park land was actually purchased in 1916.

What started out as one small plot of public land has grown into 68 properties across the state that include 29 state parks, four recreation areas, 15 state trails, four state rivers, seven state lakes and nine natural areas. These 128,797 acres attracted more than 9 million visitors in 1990.

The outcry against the deforestation of Mount Mitchell exemplified a new sense of citizen stewardship for the state's natural resources. Over the next 75 years, parks and other units were added to the system mostly because concerned citizens, working together, raised money, purchased lands and donated them to the state for protection and public use.

The economic depression of the 1930s made for difficult times for the nation, but it sparked a period of growth in North Carolina's parks system. In response to the Great Depression, the Roosevelt administration placed millions of dollars into public works programs. These federal programs eventually would develop nine state parks in North Carolina.

New opportunity for state parks sprang out of the establishment of the Civilian Conservation Corps (CCC) in the spring of 1933. The first CCC camp was located at Fort Macon State Park in Carteret County where a hard surface road was laid and reconstruction of the crumbling fort was begun. The camp consisted of 36 buildings and several hundred workers.

The CCC constructed a large wooden concession stand and restroom complex, built a pumping reservoir, laid a pipeline and performed considerable trail work. Other detachments of the CCC were established at Morrow Mountain, Hanging Rock and Singletary Lake state parks. The CCC and other federal programs from that era are responsible for a sizeable amount of development in many state parks.

Another park that benefited by federal work programs was Jones Lake in Bladen County, the first state park for North Carolina's black citizens. Beginning in 1936, farmland was purchased by the federal government at an average cost of $4.51 per acre and a program of land conservation and use was begun to stimulate the depressed economy. With local materials and talents, the Resettlement Administration developed a recreation center at Jones Lake. Construction of a bathhouse, protected beach, picnic grounds and a refreshment stand provided visitor facilities, and the property was leased to the state on July 1, 1939. Jones Lake State

MELISSA McGAW

***One of North Carolina's** outermost state parks, Hammocks Beach State Park, familiarly known as Bear Island (top), offers miles of secluded beaches where endangered sea turtles lay their eggs. Ranger Dave Cook (above) enthralls a group of children at Morrow Mountain State Park as he explains the aquatic life of Lake Tillery.*

A Legacy In Waiting

GLENDA SMITH

Addressing the audience *at festivities celebrating the 75th anniversary of State Parks held at Mount Mitchell last May, Gov. Martin challenged North Carolinians to live up to the legacy left by those who began the state parks system.*

Park opened that summer and achieved immediate popularity. In later years, the park, like all other North Carolina parks, became fully integrated. The land was given to the state by the federal government in October 1954.

The 76th anniversary of the state parks system offers an excellent opportunity to recognize those who worked on behalf of the parks and to celebrate the outstanding natural resources they protect, according to Dr. Philip K. McKnelly, director of the N. C. Division of Parks and Recreation.

"I have said this before, many times, that from a resource standpoint, North Carolina's state parks system is unmatched," McKnelly says. "The system offers a wide variety of opportunities for visitors to and residents of our state. The state's scenic beauty and diversified natural resources are on display every day in our state parks, recreation areas and natural areas."

William W. Cobey, secretary of the N. C. Department of Environment, Health, and Natural Resources, echoes McKnelly's sentiments.

"North Carolina has been blessed with some of the most remarkable natural resources in this country, many of which are protected and preserved in our state parks system," Cobey says. "Our state parks represent important elements of our past and serve as symbols of our future."

Some representative examples of ecological diversity protected by North Carolina's park system are:

- **Jockey's Ridge State Park** (Dare County). The highest sand dune on the East Coast, Jockey's Ridge is a longtime favorite for hang gliders and others who want an exhilarating view of coastal North Carolina. Visitors can explore and learn how plants and animals survive in a harsh dune environment.
- **Merchants Millpond State Park** (Gates County). One of the state's rarest ecological communities, the millpond encompasses a classic example of a cypress-gum swamp. Massive cypress and gum trees draped with Spanish moss form a canopy for the dark, acid waters of the millpond, a wilderness sanctuary for wetland wildlife.
- **Jordan Lake State Recreation Area** (Chatham, Durham and Wake counties). It's the largest summertime home of the bald eagle in the eastern United States, where visitors can view the rare creatures during an interpretive program, or birdwatch on their own from a wildlife observation deck.
- **Stone Mountain State Park** (Wilkes and Alleghany counties). Its dome-shaped granite mass rises 600 feet above its base and the weathering action of nature has made a mini-moonscape on the granite dome. Gentle streams, trails and sheer rock face create a haven for anglers, hikers and climbers.

Yet despite their ecological value and scenic beauty, parks have been given scant fiscal support in the past, and vast needs have accumulated over the years. "The natural features of our state are truly inspiring, but the parks have suffered from a history of fiscal neglect," McKnelly says. "In our 75-year history, we have invested only $34 million for capital improvements and $40 million for land acquisition."

North Carolina, dead last in the country for years in terms of per-capita expenditures on state parks, has moved up to 49th, according to a report released by the National Association of State Park Directors. The state spends $1.37 per citizen compared to the national average of $4.50.

Recently, the N. C. Divison of Parks and Recreation identified $121 million in capital development needs and $57 million in land acquisition needs to complete existing parks. Indeed, capital improvements at some parks would provide for only the basic facilities. For example, the picnic area at Few's Ford at Eno River State Park does not have a restroom. Another case is Lake Waccamaw State Park, which, though established 15 years ago, has only a single restroom, a primitive group camping area, a picnic area and a boardwalk. Only three of the 29 parks have visitor centers where rangers can provide interpretation and environmental education programs.

Operating needs are also pressing. "Operating our state parks continues to be a struggle," McKnelly said. "Inadequate appropriations for operations have limited administration of most units to custodial management." Some park waterfront operations only marginally meet national aquatics program standards because of lifeguard shortages. The existing salary level is so low that lifeguards are hard to find, and coverage has had to be discontinued at Falls Lake and Jordan Lake state recreation areas because of the shortage of qualified applicants.

The North Carolina state trails system continues to grow with the development of additional sections of the Mountains-to-Sea Trail and other local trails and greenways. Yet some trails are badly overused and are rutted by erosion, while trail maps and guides to the trails system are lacking. And development of the state's natural and scenic rivers program has lagged behind many southeastern states. Why? The program is not funded.

McKnelly remains optimistic about the

future of the state parks in spite of the system's broad funding needs.

"The state of our state parks is not a total picture of doom and gloom," he said. "In recent years, we have made tremendous strides in capturing public attention and interest in improving our state parks system."

During the past six years, the state parks system has received $14 million for capital improvements. That figure represents 40 percent of the total capital improvement appropriation for the system over its 75-year history. The 1991 General Assembly also appropriated $2 million for repairs and renovations in state parks. The system has also received $20 million for land acquisition in the past seven years, 50 percent of the total funds appropriated for state park land acquisition. In 1989, funds were made available to support at least one maintenance position in each operated park.

"Having these resources available has had a tremendous impact on our ability to meet our mission as a state parks system," McKnelly said. "The attention and concern is there. It is just unfortunate that it comes at a time when budgets at all levels of government are so constricted. The challenge is to make this momentum carry over through these difficult times."

One private source has stepped forward to help the state parks system to meet this challenge. In February, Carolina Power & Light Company announced its "Adopt State Parks" program, becoming the first business in the country to adopt an entire state parks system. CP&L has provided $144,000 over a four-year span to fund environmental-education programs and provide seed money to encourage other groups and corporations to get involved with state parks. The power company also sponsored three regional environmental symposiums on state parks. The symposiums were held in Asheville, Research Triangle Park and Morehead City.

The CP&L grant will enable the Division of Parks and Recreation to publish teacher handbooks, student workbooks and other support materials about state parks. The educator guides, known as environmental education learning experiences, will be prepared for use by teachers as well as scout leaders or community group leaders.

The guides will include pre-park visit activities to provide preparation for educators and students before they arrive at the park. It also will provide a list of learning activities for the time spent at the resource and a post-visit activity list to serve as a reminder of what was learned at the park. Each guide will identify, explain and explore the primary theme of each park geared around a curriculum for a specific age level of students. For example, at Carolina Beach State Park in New Hanover County, the first park to have a guide developed, the theme is plant adaptations and how insectivorous plants attract and trap their prey. The park is a habitat for the rare Venus's-flytrap and other species of insect-eating plants.

Another recent source of money for state parks is the North Carolina Recreation and Natural Heritage Trust Fund. The fund receives approximately $2 million per year from collections of $10 from each $20 annual fee for personalized license plates. The fund was created in the 1987 legislative session to acquire land that represents the ecological diversity of North Carolina. The land purchased may be added to the system of parks, state trails, aesthetic forests, fish and wildlife management areas, wild and scenic rivers and natural areas for the beneficial use and enjoyment of the public.

In May, the fund's board of trustees awarded the Division of Parks and Recreation a $74,830 grant to purchase 500 acres at Lumber River State Park. The award, to be matched with a $65,000 grant from the Nature Conservancy, will allow for the first land purchase for North Carolina's newest state park. A 102-mile stretch of the Lumber River was designated as a natural and scenic river during the 1989 General Assembly.

During the most recent session, state lawmakers approved legislation levying an excise stamp tax on each deed, instrument or writing by which any interest in real property is conveyed to another person. A portion of the stamp tax will be appropriated to the Recreation and Natural Heritage Trust Fund. The new revenue is expected to generate an additional $1.5 million each year for the trust fund.

Mount Mitchell was cool and bright last May 17 as state and local officials gathered to rededicate North Carolina's first state park. For most, the symbolism was hard to miss. Seventy-five years ago an outraged citizenry had managed to protect this landmark from destructive logging. Out of their sense of stewardship they had created a park system that had endured. In 1991, in the shadows of the dead and dying spruces and firs, killed by another environmental disaster, descendants of Governor Locke Craig and Elisha Mitchell planted a tree of remembrance along the trail leading up to the park's observation tower. In the presence of that gaunt forest, dignitaries spoke of the rich natural resources preserved and protected through our state parks system, and praised the visionary citizens who had recognized the need for such a system. And, significantly, they also pointedly noted that we have not lived up to our responsibilities as stewards of these public lands.

On that windy peak, a tree had been planted and a challenge issued. Would they both survive? ☒

Donald G. Reuter is public information officer for the Division of Parks and Recreation in the Department of Environment, Health, and Natural Resources.

Poster and Book Celebrate Parks

A poster commemorating State Parks' Diamond Anniversary and featuring James Valentine's photography may be ordered from N.C. Division of Parks and Recreation (512 N. Salisbury St., Raleigh, NC 27604-1148) or Friends of State Parks (P.O. Box 396, Elon College, N.C. 27244). Posters cost $5, with a $1.75 shipping charge. Checks for $6.75 should be made payable to N.C. Division of Parks and Recreation or to Friends of State Parks.

Valentine's coffee-table book, *North Carolina* (Graphics Art Center Publishing Co., Portland, Ore.), includes superb photographs of other state parks among his landscapes. Copies are available at local bookstores for $35.00.

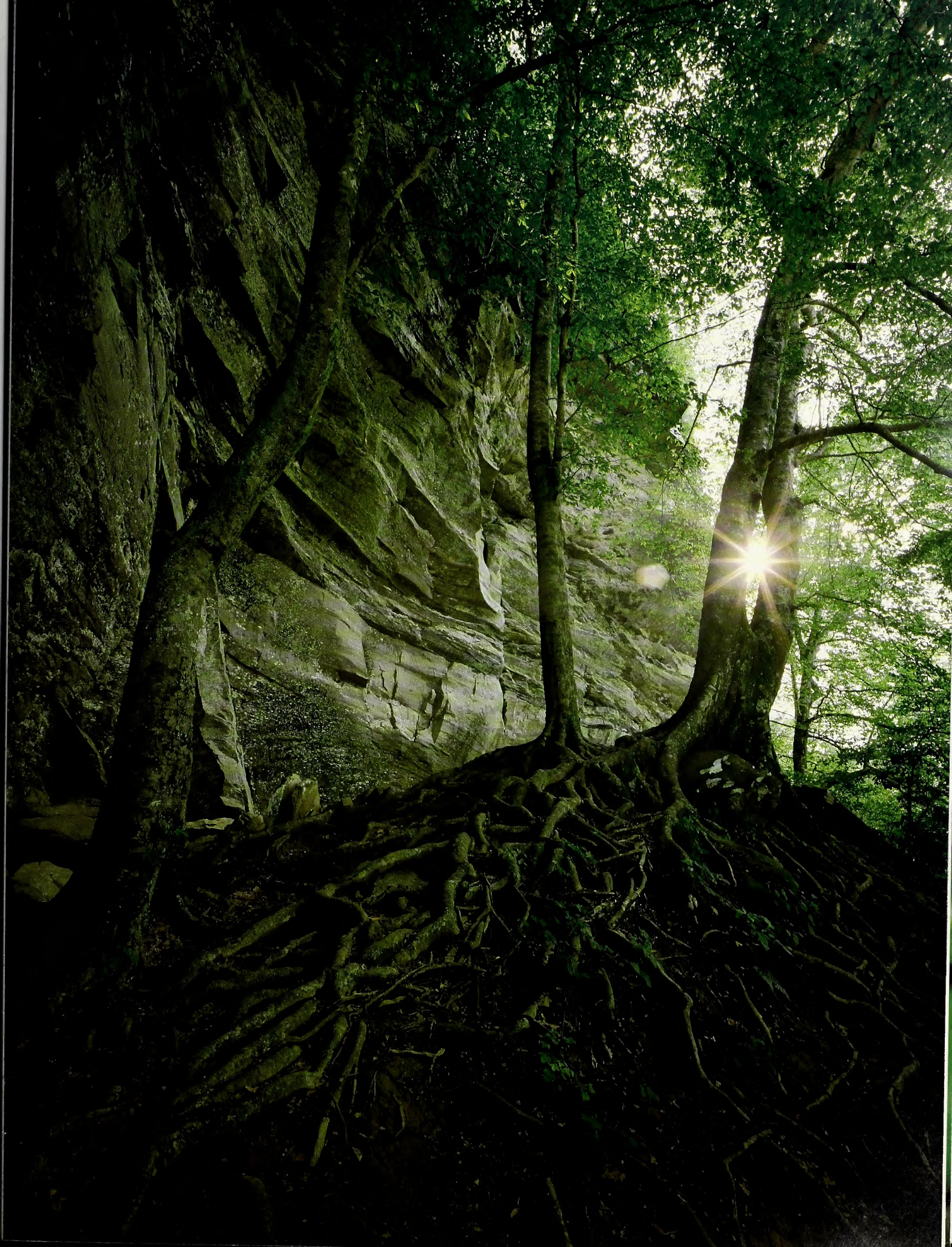
A Walk in the Parks
with James Valentine

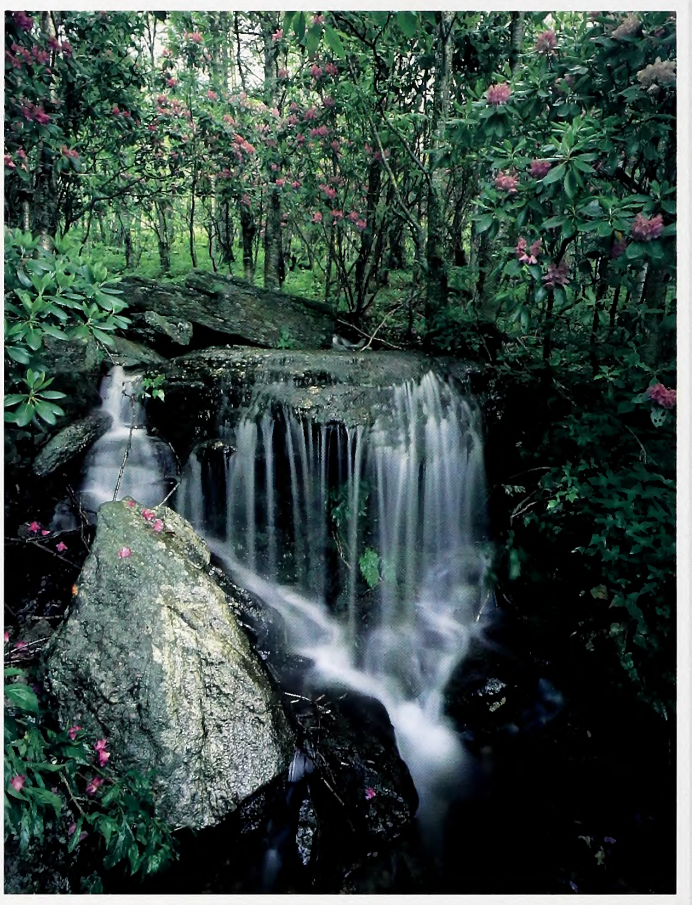
From the sandy beaches of our Atlantic shore to the forested slopes of the Appalachians, twenty-nine state parks grace the North Carolina landscape. Photographer James Valentine captures the moods of several in this parks portfolio.

©JAMES VALENTINE/GRAPHIC ARTS CENTER

Jockey's Ridge State Park
Dare County

Raven's Rock State Park
Harnett County





©JAMES VALENTINE

Mount Mitchell State Park
Yancey County

Eno River State Park
Orange County

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Photographer James Valentine has long been dedicated to wilderness and wildlife and he's had an especial interest in North Carolina, where he lived for many years. Now a resident of Florida, Valentine has produced six books of photographs, of which North Carolina *is his latest.*

Going Back to Big Flatty

"I took him at his word that somehow, someday, I would come to know this woods, and that I would need to."

by Bland Simpson ©1991

The forest of massive pines at Flatty Creek, with its gum and cypress sloughs, was my first big woods.

One bright autumn day in the mid 1950s, my father drove us southerly down through Pasquotank, past the two hulking 10-story blimp hangars, past Toxey's old gas-pop-and-beer stand, past Little Flatty and Newbegun Creeks, to a right turn at the quonset hut at Weeksville, then through the cabbage and potato lands to a crossroads called Four Forks. He pulled his maroon humpback '52 Dodge over to the side of Leigh Farm Road, threw the gear up into reverse, popped open the glove compartment, and produced a small flask about the size of a vanilla extract bottle, but clear and a clear fluid within. With no explanation Daddy said, "Put some of this on your socks and legs, son."

He had already opened it, and now I held it and smelled of it, felt around the tiny opening. It was medicine, or turpentine.

"No," I said. "It's greasy."

"Go on, put some on you."

"How come?"

"It'll keep the redbugs off you."

"The what?"

"Redbugs—some people call 'em chiggers."

"I don't want to," I said again. In our lowlying town, Elizabeth City, we had none of *these* bugs. We had mosquitoes, and a truck pulling a DDT-smoke spewing contraption that we loved and called "the fog machine" (and that we crazily ran along behind, appearing mysteriously to each other in the hazy air before it dissipated) kept the skeeters down. Still my father insisted, but I was stubborn, and we had only a scant three hours of light left. So he quit, took the little bottle back, only saying, "Well, I really wish you would, but maybe they won't be too bad."

There were three of us that first time; our other companion was a Coinjock insurance man named Paul Spry. We strode along this year's corn furrows—it would be 14 years yet before Daddy would put the road in—and I scrambled to keep up with the men. I thought we were going no farther than the far side of the field. My legs were tired by the time we reached the edge, but that was only the first quarter of the way. There at this grand and formal demarcation, my father turned and said, "Now we're going into the woods."

We were there to look at the timber, and I well remember walking and curving round and doubling and trebling back in the cool October afternoon shade beneath the hundred-foot pines with their breast-height diameters of 2 and 3 feet. This 400 acres has been family

timberland for seventy-five years now, since 1915, and my father had been prowling these woods since *his* boyhood. One of the neighbors recalled seeing him come stalking out of the wet winter late-day woods in the 1930s, Daddy drenched to the skin coming along the mule-drawn wood railway that my grandfather was bringing logs out on back then.

"Who are you?" the farmer said.

"I'm Martin Simpson," he said, "and I'm just out here seeing to my swamp."

I remember how the land got spongier the deeper into the forest we went. I remember Daddy's giving me for the first time the lesson of moss-on-the-north-side. And I remember my first sight of a big water appearing through a woods, a silver mirror lain over in the wilderness, and how thrilling it all was.

Big Flatty Creek is really a river, easily a quarter mile wide where it rounds the point of our land. Two branches, Wood Duck Creek (christened by my father) and Muddy Gut, run easterly out of our tract into the larger water. On maps Big Flatty is a cleft in the south central shore of Pasquotank County, emptying at a shanties-on-pilings fish camp named Frog Island into the great Albemarle Sound. I wouldn't be at all surprised if Ralph Lane and his tiny fleet looked in on Flatty Creek when they were exploring the Albemarle for Sir Walter Raleigh in the winter of 1585-86, sailing westerly and visiting Indian villages along the Sound's north shore before turning up Chowan River.

Back home in town that evening after my own first exploration, I was astonished that I was the innocent meeting place for a hundred or more redbugs, and that my father was now with my howling encouragement applying both calamine *and* turpentine, along with every other lotion, cream, and solvent he could find, emptying both the medicine chest and the paint locker in the garage hoping for his new pioneer-son's salvation. But it was all to no avail, because failing the preventative 6-12 I should have used (and never refused again), the only true cure now was time.

So I learned just how much he knew what he was talking about, and I took him at his word that somehow, someday I would come to know this woods, and that I would need to. But I could still be surprised.

On a blistering August afternoon in the late 1960s, a plain old railroadman named Keppy Ferrell stood in for my ailing father and drove me out to Flatty Creek to see the new road Daddy had cut into the big woods. This sandy lane, 30 feet wide and a ditch on either side, ran through the cornfield for a half a mile, turned at the woods' edge, then bore on for another mile till it hit the Creek at the point. It was to serve a small second-home development that was still in a nascent stage.

"Million dollar pro-jeck!" Keppy kept saying as we passed the blimp hangars, Newbegun, the quonset hut. On the broad dark green steps of a south Pasquotank country store where we stopped, migrants sprawled—a dozen or more on a break—and drained Pepsis and Sundrops. Second homes were at two homes' remove for these exhausted people who lived out of school buses and ponyshed quarters—they seemed as oblivious to the old man's talk when we pulled back out as they had when we'd arrived, and they simply stared after us through a heat as thick as the dust hanging over the store's bottlecap parking lot.

"Who's going to *buy* all these lots?" I finally asked the touter, a former state legislator, who first looked stricken, then gave one of the main answers to so many Southern questions since 1865:

"Why, rich *Yankees*!"

In spite of the railroadman's enthusiasm and his devotion to my father and the project, the market for such ventures soured; tall pines seeded the 40 acres of cleared ground—*and* the new road. By the time my father died on another August day four years later, there were young pines from 6 inches to 2 or 3 feet tall growing in the road, young gums

on the ditchbanks.

On the beach at Kitty Hawk one day along about that same time, an experienced timberman named Fred Markham stopped me and said:

"If you ever want me to go take a look at your woods with you, just call me up."

I knew better than to take such a good offer lightly, and in the fall of 1973, three of us in our twenties met Mister Markham, a small spry man in his middle eighties, at the big woods and stomped on in. Immediately he was out in front by 10 or 15 feet, talking back over his shoulder about trees and old times in south Pasquotank, once stopping, turning, and laughing at us as he asked,

"I'm not going too fast for you boys, now, am I?"

When we reached the fading development, he shook his head and said, "This land out here is perfect for growing trees—you don't have to do a thing, just keep an eye on it, year to year." We all of us had a ball, hated to head back two or three hours later, but he needed to check on timber of his own on the other side of the neck. Mister Markham had something of a cane, a stripped sapling, that he used more as a pointer than a steadier. Once he wheeled about, stayed me with his right, and we all focused on a 3-inch seedling and he said,

"Watch it, now—you 'bout stepped on a *pine tree*."

In a tippy wooden canoe I glided along the shore a couple of years later, noting the increase in the understory, the forest's steady return. For 20 minutes at dusk I watched a great blue heron stalk the shallows, and then I came back out in the canoe and cruised the creek at midnight, entranced by the magic of a very heavy mist and the Full Hunter's Moon that made it glow.

There were river otters here, and a woods full of owls, hawks, rabbits, muskrats. Once in July I stood in a slough off Wood Duck Creek, wondering who had discarded an old tire way back in there and then watching the tire uncoil and turn into a cottonmouth with a girth as big as my upper arm. Another time, out with a timber cruiser, I practically walked into a baby raccoon that quickly scuttled from eye level on up the slender pine and then hung on, shivering, till we moved along.

Next time out with the same cruiser, a woman from Weyerhauser, we were leaving the woods when three pickups worth of deerhunters stopped out on the Leigh Farm Road and someone fired at a deer their dogs had chased out of another piece of woods across the field. The deer dove into a drainage ditch and disappeared, but it was moving our way as it did, and I shouted and halloed at the men still half a mile distant—to no response from them.

When the deer re-emerged from the ditch, wounded and not 40 yards away and now nearly in a direct line between us and the hunters, we hit the deck. The deer ran into a pine thicket on the other side of my father's lane, and there was no further fire. We stood and walked the rest of the way out.

"Why didn't you answer?" I fairly shouted at the men as we approached. "Why didn't you call back?"

"Oh, we saw you all right," an older fellow answered, adding, "we weren't gon' shoot you." I am sure he told the truth, but I was filled with fear and fury, shivering like that raccoon up the tree, and as I pointed back up the lane toward where we'd been, all I could say in this rage was also the truth:

"Well, how the hell did *I* know that?"

Once in the dead of winter I was out with a neighbor, a farmer whose deed showed his family holding several acres on our side of a lead drainage ditch, and our family with a like amount on his side. There were 2 inches of snow on the ground when we went into the woods to walk what would become the new line after a swap, and there I saw a wondrous sight I have since seen only twice, in the Great Dismal and Down East in Carteret County,

and only after many more years had passed:

Snow in the Spanish moss.

Near this spot in the springtime, my old friend Jake Mills and his boy Mark and I marveled at bed after swaying bed of wild blue irises in the marshy upper reaches of Muddy Gut, where we turned our johnboat around and headed back out to Big Flatty and up to our fishcamp on the point. The Mills boys and I made that camp for a couple of years before we moved north and tried out the Dismal. Should have stayed put—our luck was much better on Big Flatty.

"This is old-time *river* fishing," Jake said over and over again, as we crept along the undercut banks and mortally pulled in the big bream. One evening we set a trot line with milk-jug floats, but all we found the next morning was an angry and thrashing snapping turtle we'd scarcely snagged—we emancipated him for the good of all.

We went way up each of Big Flatty's three tributaries trailing the big yellow cats and the old-time bream, stopping up one of these streams late on a Sunday morning to admire a clutch of cottonmouths sunning on the deck of a 26-foot derelict. One of my comrades—he with an immense south Georgia diamondback rattler on his Piedmont office wall—all of a sudden had a trophy in mind, but I had my hand on the throttle of our 3-horse Evinrude, and that was all the power I needed.

Not three minutes later, during our daring downstream getaway, something heavy and wet slapped my throttle hand behind me, and I let go the motor with a curdleblood scream that may still echo down in south Pasquotank. Now we knew the horror of every flatwater boatman's worst dream: the snake in the boat there with you.

I had moved forward and the boat was out of control—the cottonmouth was thrashing about in the well behind the rear seat. Jake handed me the paddle—this trophy was mine. I leaned back to get my first good look at the enemy, and what I saw and reported has the Mills boys laughing to this day:

It was a herring.

I have gone back to Big Flatty time and time again, wandered and roamed the great forest that long ago ceased to seem strange and endless to me, and if I have found some small purchase on the way of the wilderness, it began there when I was still a small boy.

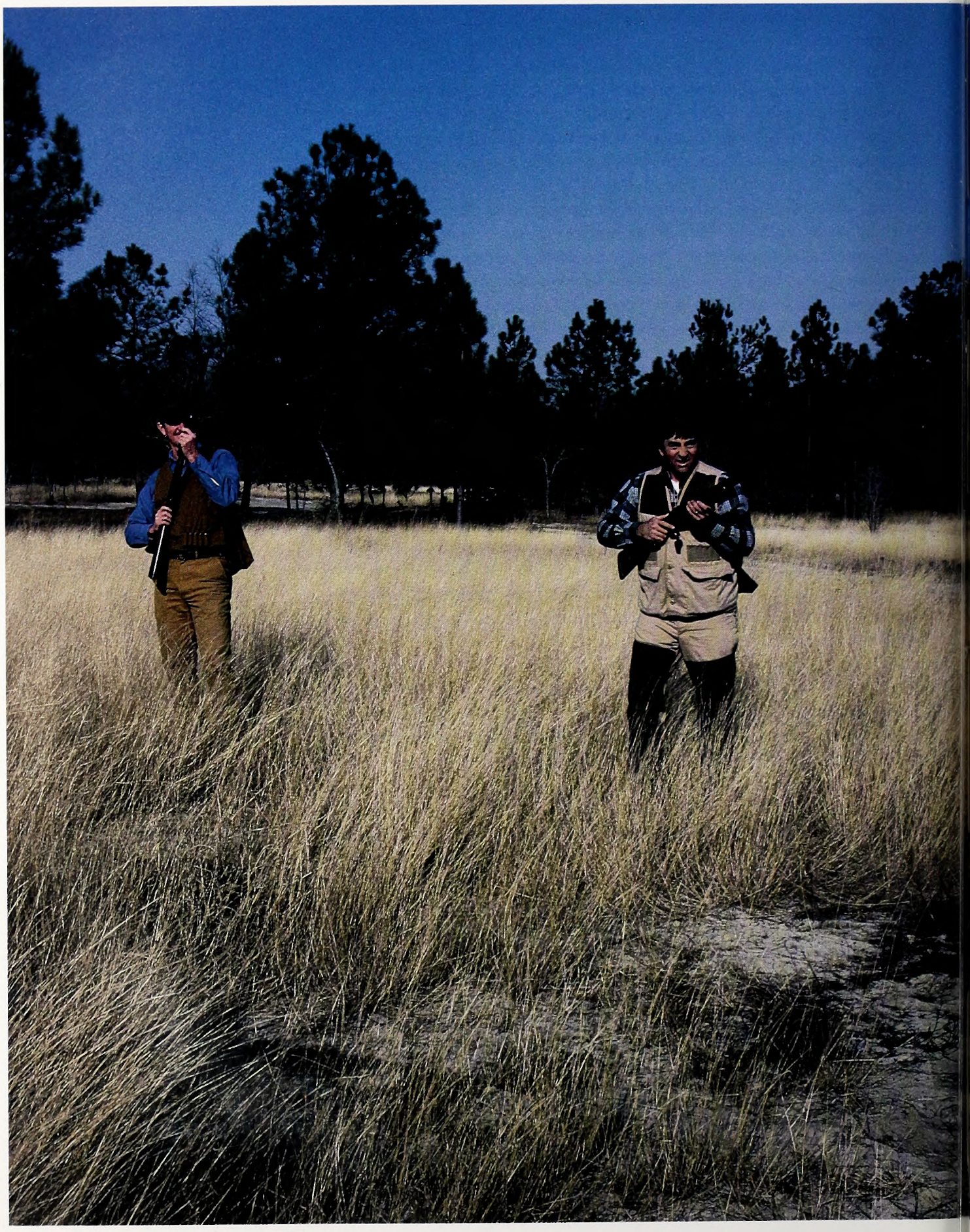
On the second of November last, my wife Ann and I set out down the lane, driving to the edge of the woods where the rusting hulk of an ancient log skidder had sat for a generation. It was a bright, balmy blue-sky day, and I smiled as we rubbed a little Cutter's on our arms and necks, on our legs beneath our socks. Now the pines in the road have grown up, 20 years and 30 feet tall, and we strode far more easily than I ever did when they were breast-height and bushy. The lane was clear, a carpet of pine needles all the way to the quarter-acre of reeds at the road's end, where Jake and Mark and I hacked out our fishcamps nearly a decade ago.

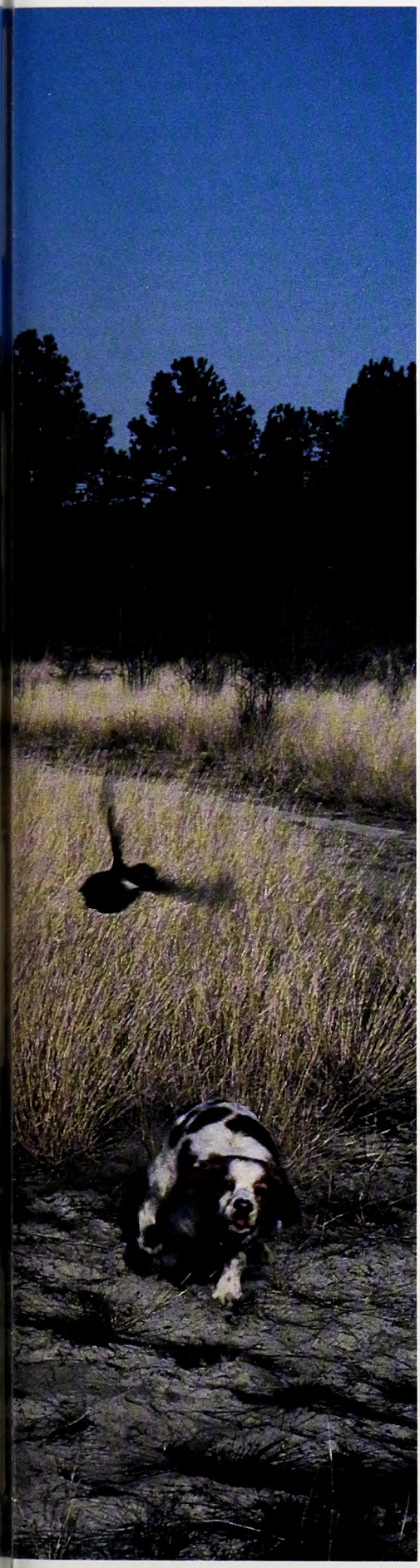
It is a mixed woods, and we like it that way. Where the last cutting was heaviest, the pines and young gums were coming on strong, and I thought of the surety in old man Markham's voice that fall day 18 years before, and even more of the great whispering pines I had first seen here 35 years ago. Now I was the one, the man other men who scarcely knew me would see coming out of the forest in all weathers; and now we were the ones, Ann and I, walking down the lane hands clasped and talking with sweet feeling of what we, and our children, might do and learn together in this place.

A few days later, back in the redclay hillcountry, Jake listened patiently as I told him of the changes in the woods, and what it felt like to be there yet again, and this time for the first time with her, till finally he said,

"Yeah, but what I really want to know is: did y'all get yourselves any *chiggers*?" ⊠

ILLUSTRATED BY DAVID WILLIAMS





KEN TAYLOR

BREAKTHROUGH ON BOBWHITES?

Biologists are rethinking everything from food plots and controlled burns to late seasons and predation.

by Vic Venters

After a couple of thousand studies or so, you'd think biologists would have learned everything they need to know about managing bobwhite quail. After all, Gentleman Bob is the most intensively studied game bird in North America.

Truth is, biologists admit they still have a lot to learn, especially concerning population dynamics, those factors that influence the fluctuations and size of bobwhite populations from year to year. In part, this is because studying whole populations of quail in the wild has been very difficult in the past, not to mention expensive and labor intensive. However, in recent years, advances in tiny radio-transmitter designs are now allowing bobwhite biologists to study many aspects of quail biology more closely than ever before.

Using these new transmitters, a team of biologists working at Fort Bragg near Fayetteville has just completed a major seven-year quail research study that examined, among other things, the relationship between habitat, predation and hunting on quail populations at the base.

Already, bobwhite biologists around the country are taking note of the study because of its size, duration and the depth of its field studies. From the data collected, we've learned that predators, especially certain raptor species, take a heavy toll on quail every year. We humans don't escape blame either; researchers have determined that hunting, particularly late-season hunting, can make quail more susceptible to predators. They also discovered that certain popular habitat management practices such as establishing food plots, if not done correctly, may actually hurt instead of help bobwhite populations.

For the past 30 years or so, and perhaps longer, bobwhite have been declining across the Southeast. Populations began to slide noticeably in the mid 1960s, a downward trend that intensified into a tailspin in the 1980s. Habitat destruction and alteration have been obvious culprits. Shifts from small family farms to large mechanized clean-farming techniques, land conversion to large-scale pine monoculture, urban and suburban sprawl and increased pesticide and herbicide use have robbed the southern landscape of much of the food, cover and breeding habitat that quail need to prosper. A persistent drought through the 1980s hurt reproductive success and made population problems even worse.

At Fort Bragg, quail populations also followed this depressing pattern during the 1970s and '80s. In the early 1970s, hunters harvested between 6,000 and 9,000 birds per year at the 150,000 acre base. Unfortunately, quail populations declined rapidly through the 1970s and into the 1980s. By 1985, records showed about 650 quail were taken off the base that year. Concerned hunters asked for research to determine the reasons for the crash. In 1983, a project, funded largely by the Department of Defense, was initiated under the leadership of Dr. Phil Doerr, a zoology and forestry

The bobwhite is still a favorite of hunters and dogs across the Southeast, but quail populations aren't what they used to be. Declining habitat has long been considered the major problem, but now biologists are beginning to unravel the knotted clues to some other related causes.

BREAKTHROUGH ON BOBWHITES?

VIC VENTERS

professor at North Carolina State University (and quail hunter, too). Quail Unlimited, the National Rifle Association and the N.C. Wildlife Resources Commission provided additional funding.

Located in the Sandhills of North Carolina, Fort Bragg provides what many biologists consider "mediocre" quail habitat: poor, sandy soils and a shortage of food and cover. On upland areas, the landscape is dominated by longleaf pines with a groundcover of wire grass and turkey oaks, with wetter areas dominated by pond pine and thick shrub species. There were also about 900 acres of food plots scattered throughout the base.

Under Dr. Doerr's supervision, three separate teams, led respectively by Paul Curtis, Fred Robinette and Everette Allen, live-trapped quail and fitted them with small radio transmitters. In the past, radio transmitters had been so big and bulky that they affected the quail's survival rates. However, the new designs are so small and weigh so little that survival rates are not affected. These radio collars gave biologists the ability to closely monitor day-to-day quail movements, locations and behavior, and to determine causes of bobwhite mortality.

One of the project's goals was to compare annual survival rates of both hunted and non-hunted quail populations at Fort Bragg and at the intensively managed Tall Timbers Research Station in Florida, the South's oldest and most prestigious bobwhite research center.

Two teams, led by Paul Curtis and Fred Robinette, discovered survival rates were significantly lower in hunted areas at Bragg than on non-hunted areas at both Bragg and Tall Timbers. For instance, survival rates in hunted areas were only 6 percent for two years and only slightly higher the following two years. On the other hand, at non-hunted areas of Tall Timbers, annual survival rates were about 25 percent and survival rates were also higher at non-hunted Fort Bragg sites. As a result, biologists discovered that fall quail populations at non-hunted sites were higher than in the hunted areas.

The researchers also found that raptors

***Researcher Everette Allen** and project intern Chris Turner (with antenna) track a bobwhite quail equipped with a radio transmitter in the study area at Ft. Bragg. Results of this, and other, studies have provided evidence that some traditional quail management techniques may need to be altered.*

were killing a lot of quail at both Fort Bragg and Tall Timbers—taking over 60 percent of all quail killed during the winter. The most deadly raptors on quail were the *Accipiter* hawk species like the Cooper's hawk and sharp-shinned hawk. Hunters took about 20 percent of the quail killed during the winter, while mammalian predators took the remaining 20 percent. In the summer, however, avian predation decreased, while mammalian predation rates greatly increased.

Although hunters only took about 20 percent of the quail killed in the winter, researchers found they were creating conditions that made it easier for avian predators to prey on bobwhites. Because Bragg is a public hunting area, it wasn't uncommon for quail coveys to be flushed more than once a day by constant hunting pressure. Since hawks hunt by sight and sound, the scattered quail that were moving about and calling to reform into coveys were apparently easy pickings for raptors, especially the accipiters. At Fort Bragg, much of the hunting pressure was taking place in late winter—when accipiter migration peaks—thereby increasing predation rates. Researchers were also able to determine that winter mortality was higher in hunted areas than in non-hunted areas. In other words, hunting and predation rates were not independent of each other.

The researchers concluded that the combination of hunting and heavy predation were at least partially responsible for the severe quail declines at Fort Bragg. "Our data indicate that avian and mammalian predators remove a large proportion of the quail population each year, and the combination of natural mortality and hunting losses may cause serious population declines," wrote the research team.

In the past, bird hunters have been told that quail cannot be "stockpiled" and that hunting and predation have little effect on populations. Because quail suffer high annual mortality—about 80 percent die whether they are hunted or not—hunting was assumed to be completely *compensatory*, meaning hunters killed only those birds that would have died anyway of other causes. The results at Fort Bragg, on the other hand, indicated that some of the hunting losses and increased predation losses due to hunting were *additive*, meaning hunters and predators were killing birds that might have survived the winter to breed and multiply.

The results raise many important questions for both wildlife managers and bird hunters. Does the concept of compensatory mortality remain biologically sound? Are hunting and healthy quail populations still compatible? Don't predator/prey populations operate in a delicate balance?

The answer remains "yes" on all counts but it's a qualified yes. The sad fact is that the widespread destruction and alteration of quail habitat throughout the South may have changed the way bobwhite populations respond to factors such as predation—either by man, bird or mammal. Because of habitat changes, remaining quail populations throughout Dixie have been pushed into "islands" of suitable habitat. The quail in these habitat islands are thereby concentrated and biologically isolated, making them more susceptible to disease, reproductive problems, excessive predation, heavy hunting pressure or any combination of these factors. If "island" populations are depleted or extirpated, a rebound becomes all the more difficult because there are few or no birds in the surrounding area to help repopulate an area.

One point should be emphasized. Nobody believes that hunting is the primary factor driving quail declines across North Carolina or the rest of the South. It's been well-documented that quail have declined—sometimes drastically—on non-hunted areas with good habitat. Factors such as weather—the drought of the 1980s, for example—play a major role in population fluctuations. There's little doubt that the massive habitat destruction and alteration across the South in recent decades remain the root problems of plummeting populations.

While hunting alone is not a problem, recent research indicates that heavy hunting

***Fast-moving technology** has recently produced a feather-light transmitter and antenna as tiny as a postal stamp, and this revolutionary tool is proving to be a boon in tracking and studying small game species like bobwhite quail.*

MELISSA McGAW

BREAKTHROUGH ON BOBWHITES?

LLOYD B. HILL

The use of tiny transmitters has helped biologists confirm the suspicion that planting wildlife food plots—long considered a staple management technique—can actually contribute to bobwhite mortality if they are poorly planned and placed. Not only do some food plots attract small game, predators also learn to hunt there.

pressure late in the season can be. Recently, results from a 15-year study conducted by biologists at Tall Timbers and projects in Illinois strongly suggest that late-winter hunting mortality removes birds that might survive to breed. The Fort Bragg research confirms this, with the added complication of increasing predation.

"Quail hunting can still be compensatory, especially when hunting losses occur early in the season," explained Paul Curtis, now a professor at Cornell University. "You run into problems with late-season hunting where you have low populations on marginal habitat."

Fred Robinette agreed. "Although my work at Fort Bragg suggested that hunting may be a potential factor depressing quail populations, particularly low populations," he said, "I should emphasize that this is what occurred on an area with excellent road access and constant hunter effort throughout the season."

Biologists also believe that the mediocre habitat at Bragg played a direct and major role in the low annual survival rates and the subsequent bobwhite declines. Altered timbering and burning schedules in the 1970s and '80s led to a substantial decrease in high-quality quail habitat. Because food resources at Bragg were widely separated from cover and breeding habitat, quail at Bragg have to move over greater distances, thereby exposing themselves to increased predation.

The study also reinforced what biologists have suspected for years: food plots, if not located properly or surrounded with good escape cover, can do more harm than good. At Bragg, predators were discovered to concentrate their hunting around food plots. Unfortunately, many of Bragg's food plots had been planted where the land could be cleared with a minimum of expense. Consequently, many plots are located on sandy, infertile ridges with little surrounding escape cover. Because of a lack of cover, these food plots for quail became, in essence, food plots for predators, too. Food plots can also concentrate birds for excessive hunting pressure.

"Some of the lessons learned at Fort Bragg were the same as those promoted by

BIRDS for the TAKING

Any old-time bird hunter worth his salt knows better than to shoot a covey "down to nothing." For years, common sense and experience told hunters that if a covey was shot out, it would be years before other birds would repopulate the suitable habitat. With quail habitat increasingly fragmented and biologically isolated, many bobwhite biologists are now advocating an even lighter harvest than in years past. If a covey is shot out now, there may not be any bobwhites from surrounding land to help populations rebound.

"People used to preach that you could shoot birds as hard as you wanted and they would come back," said Tall Timber's Clay Sisson. "We don't believe that anymore. Things are different now with habitat so fragmented. We are definitely stressing a more conservative harvest rate."

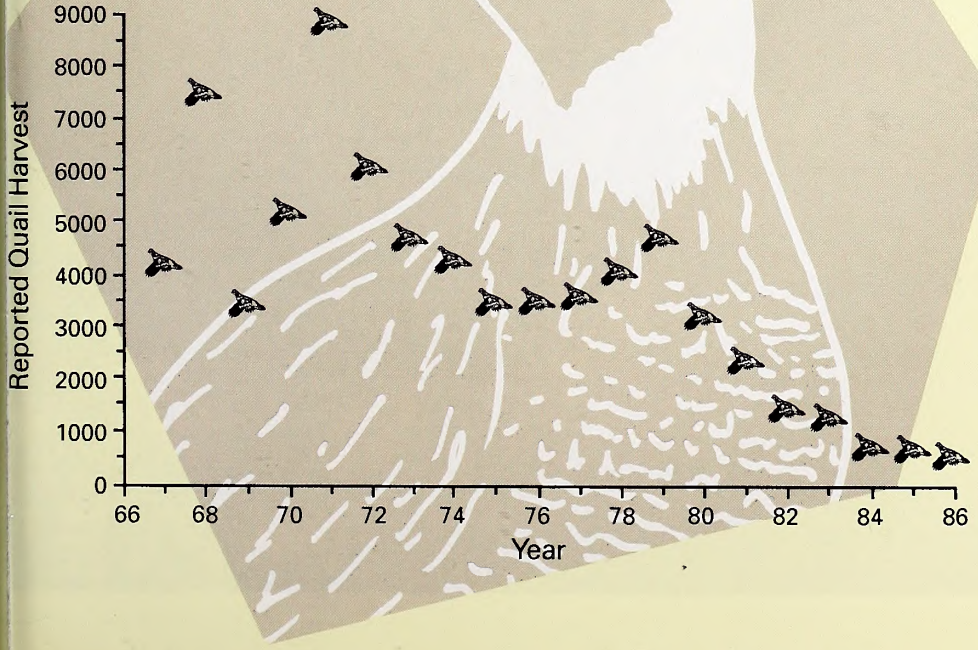
Because most quail hunting takes place on private lands, land owners or hunters often have some control over hunting pressure on the land. Here are a few tips to keep in mind.

- Harvest no more than 20 to 30 percent of a covey's fall population. In the past, many quail managers said you could safely harvest from 30 to 60 percent of a covey's fall population. Today, biologists at Tall Timbers—who have researched quail for decades—recommend maximum harvests of 20 percent of a covey's population. Other biologists believe you can harvest up to 30 percent safely but not much more.
- Shoot the covey rise and forget the singles. Aside from the actual harvest, pursuing singles scatters the covey, makes it harder for the bobwhites to reform and exposes them to increased predation.
- Count cripples as part of your bag when determining what percentage of a covey to harvest. Researchers believe most "feathered" (lightly hit) birds do not survive.
- Do most of your hunting early in the season. "Birds that have survived into the late season have got to be considered potential breeders," said Paul Curtis. "Raptors won't be as prevalent, either."
- Hunt coveys no more than once a week and less often if possible. Flushing and disturbing birds late in the season exposes them to more predation.

This conservative harvest strategy is no quick-fix solution. Reduced harvest will help only if you've got the habitat quail need to survive in and successfully reproduce. In this sense, maintaining high-quality habitat remains paramount. If proper habitat does not exist, quail will not prosper whether they are hunted or not. Good bobwhite habitat must provide four essentials: breeding cover, escape cover, food and water. These days, providing escape cover seems to be especially important.

- Controlled burning has long been recognized as one of the most beneficial management techniques for increasing quail populations. Given predation rates, however, more emphasis may need to be placed on retaining enough post-fire cover to provide quail protection. Biologists recommend leaving at least 20 percent of unburned cover habitat within a covey's range.
- Controlled burning schedules may need to be moved up in some instances from late winter/early spring to late spring when raptors migrating north have passed through.
- Food plots tend to concentrate quail and increase mortality, especially in late winter. Unless surrounded by good escape cover to minimize predation, a food plot will probably do more harm than good. Several small dispersed food plots or long strip plantings are preferable to one large plot.
- Comprehensive management practices such as prescribed burning, thinning woodlands, spring disking of fallow lands, and leaving crop residues during winter are preferable to establishing isolated food plots.

Annual Bobwhite Quail Harvest at Fort Bragg



BREAKTHROUGH ON BOBWHITES?

quail researchers in the 1930s," said Terry Sharpe, small-game project leader for the N.C. Wildlife Resources Commission. "Habitat management must concentrate on techniques that provide birds with diverse and well-dispersed food and cover. In other words, land-management practices such as timber thinning, prescribed fire, crop residue management, spring strip disking and wide field borders will yield greater benefits than simply planting food plots to concentrate birds."

Despite the unique set of problems posed by the habitat and public access at Bragg, biologists believe there are some general lessons. "The information we've learned is probably applicable to areas where you have relatively low-density quail populations and somewhat marginal habitat—whether it's because of poor quality soils, poor dispersion of habitat or intensively farmed areas with poor habitat," Curtis explained.

For low quail populations to rebound in mediocre habitat, researchers believe quail must have higher survival rates than the 6 percent found at Fort Bragg. While it's true quail cannot be "stockpiled" in numbers greater than the carrying capacity of their habitat, it does seem possible to save a few more birds as "seed" for a population recovery—especially during a bad breeding year. "If you're looking at a poor reproductive year, all the evidence suggests that it is important to have as many carry-over birds as possible going into the breeding season," said Clay Sisson, the quail biologist at Tall Timbers Research Station. "The problem is, there's no way of knowing what your breeding season is going to be during winter hunting season."

The conservative approach to this potential problem is to allow more birds to survive the winter. This can be done by providing good escape cover to help quail hide from predators, and also by decreasing hunting pressure during late winter. (See "Birds for the Taking," p. 21).

The impact of raptors on quail populations is a touchy subject. Never popular with bird hunters, hawks will probably shoulder an even worse reputation now. Indeed, accipiter species like the Cooper's hawk or sharp-shinned hawk are quail-killers, capable of easily flushing and catching a bobwhite in flight or on the ground.

Because of the accipiters's habits, wildlife managers fear that some hunters or land owners may be tempted to resort to the illegal shooting and wholesale killing of all birds of prey. In addition to being illegal and ethically indefensible, however, any avian predator control would actually do far more harm than good by removing raptors that feed on nest-destroying rodents and reptiles.

Most of the raptors that would be illegally shot, trapped or killed would probably be owls or *Buteo* hawks like the red-tailed or red-shouldered hawks. Buteos are the species hunters commonly see soaring or perched over fields searching for a meal. While buteos will eat an occasional quail, they are not particularly well-adapted to catching prey as fast as a bobwhite. Instead, buteos are far better at catching rodents, reptiles and small mammals.

"The indiscriminate killing of hawks is definitely not the answer," explained Brad Mueller, a consulting quail biologist and a former Tall Timbers quail biologist who has studied raptor predation on quail. "Although several raptor species prey on quail, the majority (of hawk species) apparently cause little damage to quail populations and may actually benefit bobwhites by feeding on nest-destroying rodents and reptiles."

Past experiments at quail plantations have shown that removing hawks such as the buteo species and all other predators results in an explosive population growth of rodents such as the prolific cotton rat, a pest that competes both for quail food and destroys quail nests. The results? Catastrophe for breeding quail. Biologists believe buteo and owls probably do far more good than harm to quail populations.

Furthermore, the hawks that prey most effectively on quail—the accipiters—are largely migratory. They're here today and gone tomorrow. They are also very secretive, wary and elusive. In other words, accipiters would be hard to kill or control, even if raptor control were legal. And it's not.

The Fort Bragg study points out that predator/prey relationships are extremely complicated, whether the predators are humans or hawks. While some will see birds of prey as easy scapegoats, their persecution will not bring back bobwhite populations. The Fort Bragg study has shown that the bobwhite's world and the way it works has changed for the worse. For quail to once again prosper, we'll have to redouble our efforts to create and preserve good habitat while avoiding the panacea of easy "solutions" to complex problems. ⊠

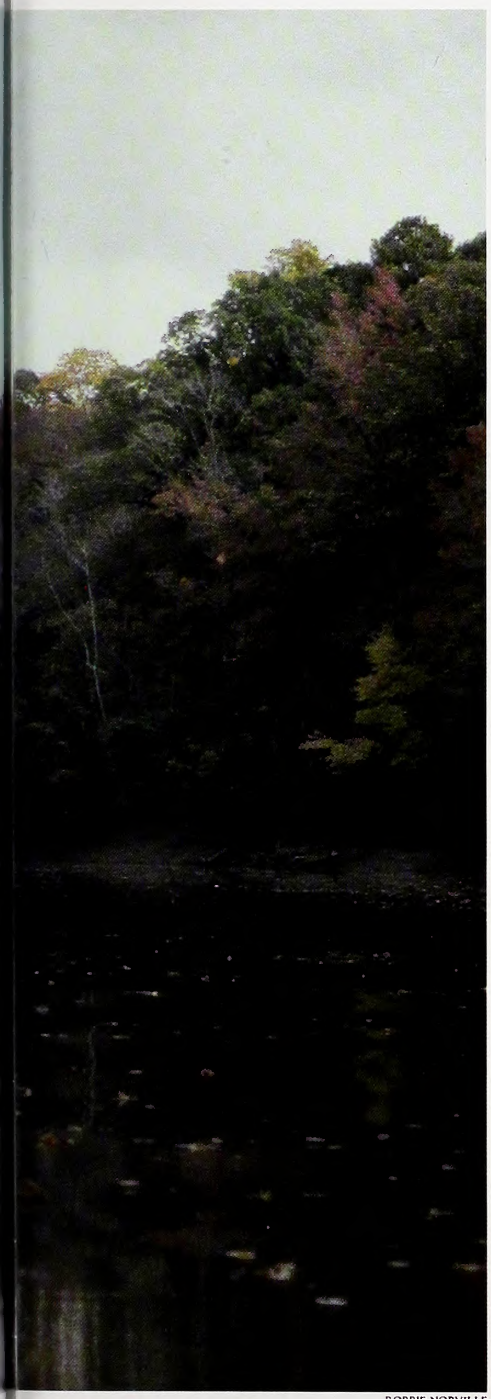
***While most raptors** are too slow to catch many bobwhites, studies reveal that swift accipiters like the Coopers hawk and this sharp-shinned hawk, shown eating a sparrow, can have an impact on small game species. Yet hawks and owls also aid bobwhites by eating many species that prey on small game.*

RIVER OF DEER

Tinged with autumn's *first colors, mature bottomland hardwoods along the Roanoke River are full of wildlife, especially white-tailed deer. A hunt in such surroundings is a rare privilege, one more and more hunters are learning to appreciate.*

Hunters who've had the good fortune to draw a permit to hunt the Roanoke River Wetlands Game Land know they've got something special.

by Robbie Norville



ROBBIE NORVILLE

"How in the world have you managed to keep this paradise a secret?" said the camouflagued hunter.

We both smiled at his half-joking question. It's a reaction I've come to expect when I interview those who've just finished their first white-tailed deer hunt on the Roanoke River Wetlands Game Land. Of course, the excellent deer-hunting on this area is no secret, but it may seem that way to those who aren't accustomed to uncrowded conditions and near-wilderness scenery.

As the hunter opened his soft drink and leaned back on his camp seat that cool October morning, I settled back to hear of yet another memorable experience in a place that has generated more than its share in the past few years.

"I had been straining for what seemed like hours to try to make out the tiny sounds coming out of this switch cane thicket that was 50 yards down the ridge from my stand," he began. "I was sure that those faint rattlings and rustlings were being made by a deer, but I wasn't ready for what happened next.

"A mature whitetail doe appeared at the edge of the cane. Suddenly, behind her, two sassy fawns burst from the thicket and nearly bowled her over trying to reach the grove of white oaks where I waited. They were followed closely by three more family groups and soon the entire procession was eating acorns below me. Before the morning was over, I had seen 17 deer from my stand, including two fat forkhorn bucks that offered several shot opportunities. But they were not the ones I had been waiting for so I quietly watched them fill their paunches and then amble out of my little corner of deer heaven."

I could certainly appreciate him having so many deer so close, but I couldn't honestly say I was surprised. As the crew leader of a habitat management team for game lands in the northeastern part of the state, I knew that just about everyone sees deer here, and often plenty of them. But aside from the numbers of deer, there are other things that make this area special. For one thing, hunting access is carefully controlled. Unlike other game lands across North Carolina, access to the Roanoke River Wetlands Game Land is by permit only, and the permits are limited and picked by random computer drawing.

The area is a unique, almost pristine riverine hardwood environment that includes some of the most extensive and ecologically important bottomland in the mid-Atlantic. At present, this public land consists of 12,959 acres that lie in five tracts—Urquhart, Broadneck Swamp, Company Swamp, Speller-Outlaw and Conine Island—mostly accessible by boat along the Roanoke River in Bertie, Martin and Halifax counties. Some tracts are owned by the N.C. Wildlife Resources Commission while others comprise the Roanoke River National Wildlife Refuge. All five tracts are open to deer hunting. Acquisition of this land actually began in 1986 and continues to this day as tracts become available. (See "The Battle For The Roanoke Refuge," December 1989).

Eventually, plans are to increase the area of public ownership to 33,000 acres in the wildlife refuge and an additional 14,000 acres of game lands owned by the Wildlife Commission. Hunting will continue to be allowed on all tracts regardless of ownership; however, waterfowl hunting will continue to be open only in designated areas.

As a habitat management crew leader, my job is to plan and implement management projects on the Roanoke River Wetlands Game Land. When my supervisors and I initially surveyed the first acquisitions of the expanding Roanoke River Wetlands Game Land, we looked for a system that would allow public hunting and, at the same time, preserve the outstanding quality of hunting that had been present here during the many years these areas were under the control of private hunt clubs. We knew that overcrowding could cause problems and degrade the hunting experience. By following our instincts and comments from the hunting public, we recommended that hunting be controlled by a permit-only system.

Upon approval by the Wildlife Commission, the first permit hunt was offered to sportsmen in the fall of 1987. "The hunts generated more positive comments and phone calls to our office than anything we have done in a long time," says Grady Barnes, section manager for the Commission's Division of Wildlife Management. There are a total of 496 permits available for

DALE DAVIS

***Linda Cobb shot** this forkhorn whitetail on one of the special permit hunts offered on five near-wilderness tracts in the Roanoke River Wetlands Game Land. At 12,959 acres and still growing, this rare bottomland habitat is now protected against development.*

the five tracts now open to hunting during the regular gun deer season. The permits are issued by tract for a two-day hunt and chances of being drawn are excellent judging from the numbers of applications received in the past. By limiting the number of permits for each tract, the hunting pressure is dispersed resulting in a higher quality experience for those involved. Currently, there are 30 permits issued for Conine Island, 12 for Urquhart, 30 for Speller-Outlaw, 40 for Broadneck Swamp, and 12 for Company Swamp per two-day hunt. The hunts are slated for Fridays and Saturdays beginningthe first weekend of the regular gun deer season in October and continuing until mid-November. Unlimited permits are available for the primitive weapons seasons and a bow hunter or muzzleloader hunter can hunt any tract he or she wishes. Hunters can apply by filling out the application using instructions included in the *1991-92 North Carolina Inland Fishing, Hunting and Trapping Regulations Digest* available free with the purchase of a hunting license.

"You can't make a bad choice when you're deciding which tract to apply for," says Tommy Hughes, management biologist for the coastal region. Deer densities exceed 50 deer per square mile in most of these areas, and because hunting has been limited since 1987, all of the areas have a high deer population with trophy potential.

The Broadneck Swamp tract, which has many mature hardwood ridges mixed with a network of backwater sloughs, has been the most popular for both primitive weapons hunters and gun hunters. This tract also has an intricate system of trails that follow many of the hardwood ridges, and they offer easy access to the interior of this area.

The Company Swamp tract has also been very popular and has produced its share of trophy swamp bucks. For the most part, the interior of this area is a mature, flooded cypress-tupelo swamp, but the fringes are a mix of mature hardwood forest, old growth cutover and intermittently flooded hardwood flats. Like Broadneck Swamp, this area also has well-maintained trails that wind along the river and down some of the ridges.

Conine Island, by far the largest of the hunting tracts at nearly 4,000 acres, is accessible by boat and vehicle. There are two maintained parking areas along Highway 17 north of Williamston, and both are situated at trail heads giving ready access to the interior of the tract. Compared to the other tracts, Conine Island has the largest permanently flooded swamp; however, much of the island consists of intermittently flooded hardwood flats that contain some of the largest swamp chestnut oaks found anywhere.

"When the acorns start falling from these trees in mid-October you almost need a hardhat on your head when you walk under them," says Dale Davis, a wildlife management technician for the Division of Wildlife Management who helps implement management projects on the Roanoke River Wetlands Game Land.

Three different tracts make up Speller-Outlaw, and these tracts have the most diverse mixture of swamp, hardwood ridges and agricultural fields of any of the areas. Its 200 acres of fields are planted in corn, soybeans and clover, and are bordered by cutovers, hardwood swamps and hardwood ridges. Speller-Outlaw also boasts a series of persimmon groves along the river that attract many wildlife species when the luscious fruits start dropping to the ground. Some hunters and biologists call these fruits "deer candy" because of the large number of whitetails that are attracted to these groves.

Last, but not least, the Urquhart tract in Halifax County is mostly upland hardwood habitat with some swamp and cutover. It also has a trail system that nearly encircles the area. Because it is remote and lacks

How to Apply

Applications for the managed either-sex deer hunts are included in the *1991-92 North Carolina Inland Fishing, Hunting and Trapping Regulations Digest*. There is a $5 nonrefundable processing fee required with each application. Groups of a maximum of five hunters desiring to hunt as a party may submit all applications together in one envelope. Party applications will be drawn as an individual application. Minors will be permitted to participate but must be accompanied by a properly licensed adult. The minor and adult should submit their applications together as a party hunt in one envelope since both must have the required permit.

There are also permit hunts available for turkey, waterfowl, small game and trapping. Applications for these hunts can be obtained by writing to the N.C. Wildlife Resources Commission, Division of Wildlife Management, 512 N. Salisbury Street, Raleigh, NC 27604-1188.

vehicular access, Urquhart attracts fewer hunters. For this reason, it offers sportsmen an even better chance to get away from civilization and enjoy some fine deer hunting. One hunter told me that he had never harvested a deer as quickly as he did on his first trip to Urquhart.

"After we found a nice place to camp," he said as he was preparing to dress his deer, "I decided to scout a little before setting up the tent. I had only walked about 100 yards when I saw a herd of deer approaching from down the ridge. I just slipped behind the largest tree I could find, picked the largest deer out of the group of 10 and the rest is history."

Camping is encouraged on these areas, and is almost a necessity to fully enjoy the experience. Primitive camping is the rule and camps are allowed within a 100-yard zone of the river. Besides the obvious equipment needed for camping, hunters should bring a good pair of hip boots and a compass. "You can forget to bring anything when you come hunting in these swamps, but a compass ain't one of them," one hunter told me.

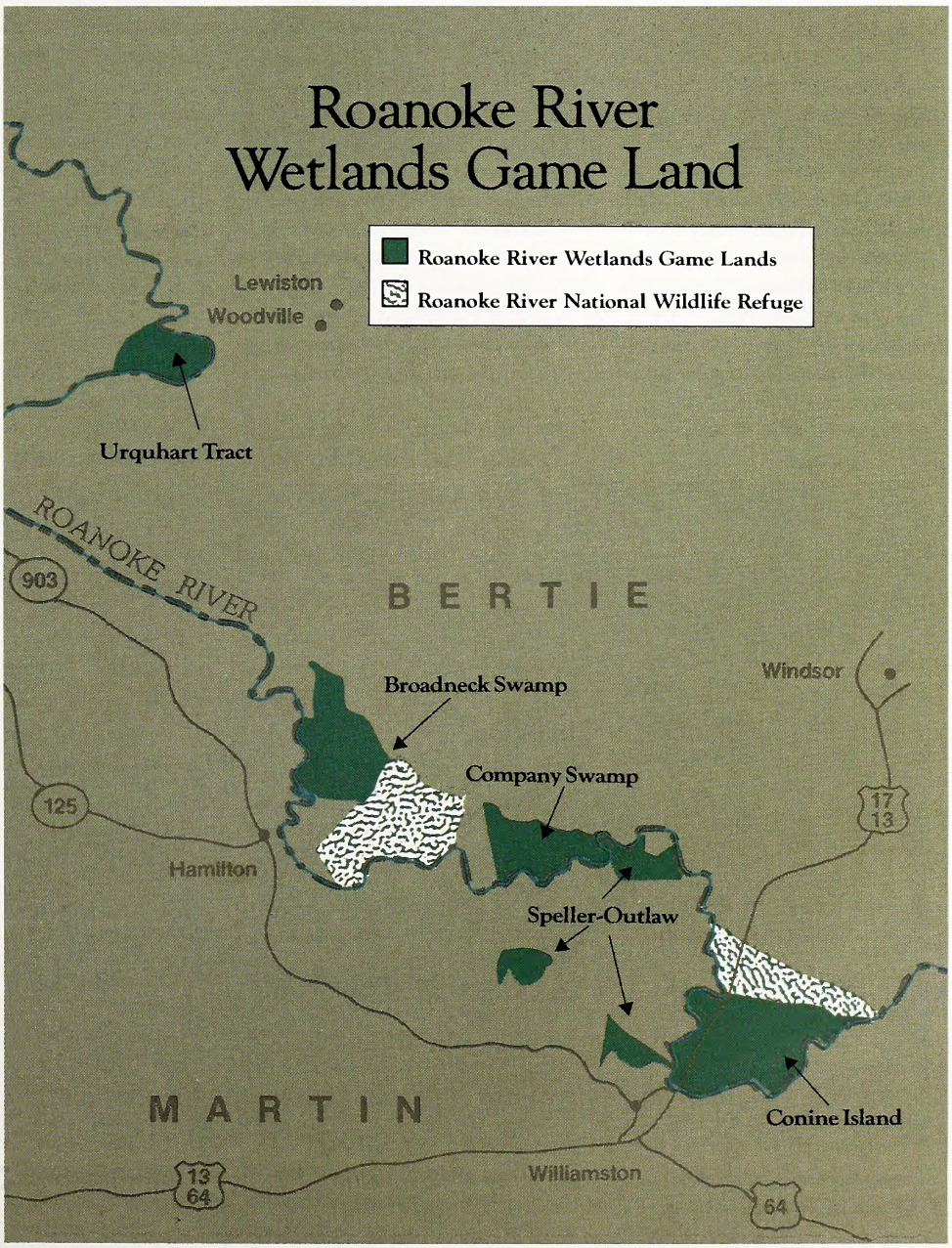
Hunters can get access to these lands by boat at N.C. Wildlife Resources Commission boating access areas located in Williamston and Hamilton. A boat 15-feet or longer with at least a 15-horsepower outboard is recommended. The Roanoke River can be quite treacherous in times of high water and newcomers are encouraged to exercise caution when navigating the river, especially for the first time. Floating and half-submerged logs are quite common so boaters should wear proper personal flotation devices whenever traveling on the river.

Since the Roanoke River Wetlands Game Land is a part of the Roanoke River Joint Venture between the Wildlife Commission and the Roanoke River National Wildlife Refuge, special regulations apply to each area depending on ownership. Hunters should consult the regulations digest for a list of regulations governing activities on ownership of each area.

It may take a bit of extra effort to take part in a hunt on the Roanoke River Wetlands Game Land, but most agree it's worth it. The day after I talked to the hunter who told me about all the deer that had gathered under his stand, I stopped by to see how he was doing. He was wearing an even bigger smile this time.

"After talking with you yesterday, I took a short nap and then decided to try my stand in the middle of the day," he said. "I finally got settled in about 11 o'clock and immediately starting seeing deer. Two does came by first, followed by one of the bucks that I'd seen earlier. A few minutes later, a doe came flying through an opening in the woods like her tail was on fire, and about five minutes after that, I heard another deer coming from the same direction. Out stepped this monster." He pointed to the 10 pointer hanging from the meat pole. ☒

Wildlife Commission biologist Robbie Norville is a crew leader in charge of habitat management on game lands in the northeastern part of the state.



Better Season This Year?

Survey Shows Quail Populations Stable Last Year

Written and Edited by Vic Venters

Better and about the same. Those were the results of last season's quail-hunting success in North Carolina's Piedmont and Coastal Plain, as measured by the Wildlife Commission's 1990-91 Avid Quail Hunter Survey. The survey indicated that this was the second consecutive year populations have increased in the Piedmont, while they remained stable in the Coastal Plain. Since 1984, the Wildlife Commission has conducted the survey to measure quail hunting success by tabulating success and flush rates from avid quail hunters around the state. Last year, 154 avid quail hunters from 79 counties contributed data from over 3,000 hunts.

Last season, hunting parties averaged 19 trips per season and harvested 74 birds per season. The average flush rate, statewide, changed little from last season. Hunting parties again flushed one covey for each hour and 25 minutes hunted and 2.6 coveys were averaged per trip. The harvest rate for hunting parties averaged just under one bird per hour, lower than last season's average. The average party took home 3.9 birds per trip last season.

In the Piedmont, hunting success was up 57 percent over two years ago, when all measures of hunting success were measured. The season two years ago was the worst on record.

Hunting success in the Coastal Plain hasn't varied much over the last three seasons with covey flush rates showing little change. Last year, however, harvest rates dropped significantly during the season. "These declines may indicate smaller covey sizes," said Terry Sharpe, quail biologist for the Wildlife Resources Commission. "But we're not really sure."

Biologists are uncertain how the upcoming season will shape up. "The weather has generally been good, with plenty of rain," said Sharpe. "That should be a favorable factor for bobwhite reproduction. However, our mid-summer quail counts were down in the Piedmont, and about the same in the Coastal Plain. These counts measure the number of adult male birds, but are not always an effective indicator of the fall quail population. If we had a good reproductive season, we'll have more birds, but we've got no way of knowing until the season opens."

In the "are-you-jealous" category, the "most avid" avid hunter in last year's survey made 59 quail-hunting trips in the 15 week season.

LEONARD LEE RUE

Holding the Line: *Last year's avid quail hunter survey indicated that bobwhite populations were stable in the Coastal Plain and improving in the Piedmont of North Carolina.*

Blaze Orange Now Required

This season, small-game hunters in North Carolina will be required to wear blaze orange under a new law passed by the 1991 General Assembly.

Effective this fall, those who hunt quail, rabbit, squirrel, pheasant and grouse will be required to wear fluorescent orange that is visible from all sides. The orange garment can be a hat, vest, jacket or pants, as long as it is visible from all directions.

Blaze orange will not be required for turkey hunting, waterfowl hunting or for hunting migratory game birds such as doves, woodcock, rail and snipe. Nor is blaze orange required when hunting foxes, bobcats, raccoons or opossums.

The new law is an addition to the mandatory blaze-orange requirement for big-game hunting. The N.C. Wildlife Resources Commission asked state lawmakers to extend the blaze-orange requirement to small-game hunters. "The widespread use of blaze-orange has almost eliminated hunting deaths and accidents attributable to another person being mistaken for game," said Capt. Wilton Pate, head of the Commission's hunter-safety program. "Small-game seasons run concurrent with portions of big-game seasons, so this new law should help make the woods safer for all."

The new law also makes an exception for people hunting on their own land, stating, "This section does not apply to a landholder, his spouse, or children, who are hunting on land held by the landowner."

The new blaze-orange law for small game will be enforced with warning tickets until October 1992.

—Angela Dorman Hill

Forbush Team Best Overall

North Carolina Students Win Hunter Safety Competition

A team of senior high school students, trained in the state's hunter-education course, has taken top honors in a national hunter-safety competition.

After winning the overall competition for seniors in North Carolina, the Forbush High School hunter safety team from Yadkin County was named best overall in the National Rifle Association's Youth Hunter Challenge in New Mexico. Forbush student Jason Poindexter had the highest individual score at the end of the eight-category competition.

Pender County's Burgaw Middle School and Yadkin County's Forbush Elementary placed second and third in the national competition at the junior high school level. "Their wins are proof of the foundation of hunter-safety education in the state," said Capt. Wilton Pate, who oversees the Commission's safety programs. "It shows that North Carolina is receiving top-notch hunter education from our volunteer instructors."

West Carteret and the John A. Holmes high school in Chowan County, and the Flat Rock Junior High School in Henderson County also participated in the competition.

Hunter education became mandatory in North Carolina in July. First-time hunting-license buyers must successfully complete the course or show proof that they have had a hunting license in the past.

—Angela Dorman Hill

ANGELA DORMAN HILL

Winning Team: *This team of students from Yadkin County's Forbush High School took top honors in a national hunting-safety competition held this summer. Also pictured are Capt. Wilton Pate (fourth from left), head of the Wildlife Commission's hunter safety program and new Wildlife Commission Chairman Richard P. Budd (far right).*

Law Penalizes Careless Hunters

A new law passed now makes careless or "negligent" hunters responsible for the harm or damage they cause to others. Negligent hunters who cause minor injuries to a person in a hunting accident will now face fines between $500 and $2,000 and up to two years in prison, and those found responsible for serious injuries will face fines between $750 and $2,000 and a two year prison term.

The penalty for killing someone in a hunting accident will carry a fine ranging from $1,000 to $2,000 and a prison term from 30 days to two years. In all cases, restitution will be required and hunting licenses will be revoked.

—Angela Dorman Hill

Wins in Four Categories

Commission Wins Conservation Education Awards

The Wildlife Commission's Division of Conservation Education made a strong showing recently at the annual convention of the Association for Conservation Information (ACI) held in Gaylord, Michigan. The division took home three first-place awards and one third place award. ACI is an international association of state and federal conservation agencies.

The winners included the *North Carolina Wildlife Calendar*, which won a first place award in the special publications category. This is the fourth year in a row the Wildlife Calendar has won first place awards in this category.

Also winning was *North Carolina WILD Notebook*, which took home two first place awards in the black and white/two-color periodical category and the education publication category. *North Carolina WILD Notebook* is the official publication of North Carolina WILD, an environmental education program administered in North Carolina by the Wildlife Commission. This is the third year in a row that *North Carolina WILD Notebook* has won either first or second place in the education category at ACI.

Also garnering an award was the *North Carolina WILD Video*, which won third place among special efforts. This video film was produced to introduce Project WILD and North Carolina WILD to teachers around the state.

North Carolina WILD is the environmental education program of the Wildlife Resources Commission and includes Project WILD as a chief component. Project WILD is a national award-winning environmental education program consisting of instructional workshops and supplementary curriculum materials for teachers of kindergarten through high-school age students. The goal of Project WILD is to raise students' awareness of the environment and conservation issues and prepare them to make responsible decisions. The program emphasizes wildlife and the conservation of natural resources and is sponsored principally by state wildlife agencies and state departments of education.

Conservation Group Helps Bobwhites

Quail Unlimited Has Successful Year with Field Work and Fund Raising

The best way to have a good quail-hunting season is to spend some time during the off-season improving bobwhite habitat. This means providing nesting and escape cover and, if necessary, food plantings. Joining and becoming active in Quail Unlimited (QU), a conservation group dedicated to improving habitat for quail and other wildlife, is one of the best ways individuals can help preserve the southern quail hunting tradition.

Last year, QU raised $54,000 (net) in North Carolina to be used for quail preservation. Of that amount, 80 percent, or $43,000, was returned for conservation work in North Carolina. In the state, QU distributed enough seed for 60,000 wildlife food plots. Volunteers from chapters also planted food and cover plots on numerous gamelands and national forests around the state. For instance, at the Falls of the Neuse Game Lands last spring, the Falls of the Neuse QU chapter planted over 167 food, hedgerow and brood cover areas for a combined length of over 9 miles.

STEVE BROWN

Habitat Help: *Quail Unlimited volunteers like these members of the Falls of the Neuse chapter performed valuable field work and raised money for bobwhite conservation in North Carolina last year. Habitat improvement is the key to increasing bobwhite populations.*

In addition to last year's work in the field, QU also helped finance landowner workshops to provide technical assistance, youth hunter education programs, educational booklets and pamphlets and a college scholarship.

Currently, QU has about 3,500 members in 15 active chapters in North Carolina, with several others in the start-up stage. For more information, or to join, write Quail Unlimited, P.O. Box 10041, Augusta, Georgia, 30903-2641, or call (803) 637-5731.

Will Aid Business or Education

State Environmental Law Directory Available

A comprehensive directory to North Carolina's environmental laws and regulations is now available from the state's Department of Environment, Health and Natural Resources. The directory should be of interest to business owners, the real estate industry, farmers or anyone interested in environmental protection laws and required permits.

Some of the directory's features are a listing of all pertinent state laws and their statutory citations, questions that lead the user to permits that may apply to a project, listings of permit processing times and listings of permits by area or agency. Also included is a matrix using a selection of 40 businesses with an indication of environmental permits that may be required for each activity. Each permit synopsis includes the type of project requiring the permit, permit requirements, fees, processing time and contact names and addresses. The directory includes a listing of all North Carolina environmental and natural resource laws. The directory was published through the cooperation of each agency listed in the document.

In addition to state regulations, related regulatory requirements of federal agencies such as the U.S. Army Corps of Engineers and the Federal Energy Regulatory Commission are also included.

The directory's features are designed to assist in the planning of projects in order to reduce impact on the environment and to help avoid delays. The directory may be obtained from regional EHNR offices or by sending $5 to the Department of EHNR, Division of Planning & Assessment, 512 N. Salisbury St., P.O. Box 27687, Raleigh, NC 27611-7687, or call (919) 733-6376.

Adopt-A-Trail
Volunteers Needed in Smokies

Volunteers are needed on the Tar Heel side of the Great Smoky Mountains National Park to assist Park Service employees in maintaining the 900-mile system of backcountry trails.

The Adopt-A-Trail Program has already proven a success in the Tennessee portion of the park. Currently, there are about 100 volunteers helping on the Tennessee side, and park officials estimate that about the same number will be needed in North Carolina. Under the program, volunteers adopt a specific trail or portion of a trail and help maintain it. They also advise park service employees about trail conditions and hazards and assist visitors or hikers. An orientation program is available for volunteers. Volunteers will be asked to select a specific trail segment and hike it at least 10 times per year.

For more information on the Park's Adopt-A-Trail Program, or to volunteer, contact Keith Nelson, South District Backcountry Ranger, Cherokee, NC 28719, or call (704) 497-9147.

Field Notes

Eastern Gun Deer	Closes Jan. 1
Central Bow and Arrow Deer	Closes Nov. 9
Central Muzzleloading Deer	Nov. 11-16
Central Gun Deer	Opens Nov. 18
Northwestern Bow and Arrow Deer	Closes Nov. 16
Northwestern Muzzleloading Deer	Nov. 18-23
Northwestern Gun Deer	Opens Nov. 25
Western Bow and Arrow Deer	Closes Nov. 23
Western Gun Deer	Opens Nov. 25
Bear	See *Regulations Digest*
Wild Boar	See *Regulations Digest*
Gray Squirrel	Closes Jan. 31
Fox Squirrel (Only in 18 counties)	See *Regulations Digest*
Quail	Opens Nov. 23
Rabbit	Opens Nov. 23
Ruffed Grouse	Closes Feb. 29.
Raccoon and Opossum	See *Regulations Digest*
Snipe	Opens Nov. 14
Mourning Doves	Nov. 25-30
Rails, Moorhens and Gallinules	Closes Nov. 9
Ducks, Mergansers and Coots	Nov. 28-30 (middle season)
Brant	Nov. 28-30 (middle season)
Snow and Blue Geese	Opens Nov. 2
Sea Ducks	Through Jan. 15
Swan (by permit only)	Through Jan. 31

Information on bag limits, either-sex hunts, permits and other regulations may be found in the *1991-92 North Carolina Inland Fishing, Hunting & Trapping Regulations Digest*. For a copy, check with license agents or contact the N.C. Wildlife Resources Commission.

The 1992 North Carolina Wildlife Calendar Is Here!

With such artwork *as James A. Brooks' "Creekside Clearing" featured above, the North Carolina Wildlife Calendar is sure to sell out again this year.*

The works of Robert C. Flowers, Jr., Janet Allen Walker, David E. Doss, Patsy McAuley, Bob Henley, Bob Herr, Duane Raver, Larry Barton, Walt Obman, James A. Brooks, Joe Seme, and Bob Timberlake are featured in the 1992 Wildlife Calendar. Order yours today by returning the form below with your check or money order to 1992 Calendar, N.C. Wildlife Resources Commission, 512 N. Salisbury Street, Raleigh, NC 27604-1188.

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All orders must be prepaid. We do not bill. A $15.00 charge will be made on returned checks (N.C.G.S. 25-3-512).

For fund raising and bulk rate information (10 calendars or more), call 919-733-7288. Please allow 6 weeks for delivery.

CALO92

Fall Plowing Hurts Wildlife

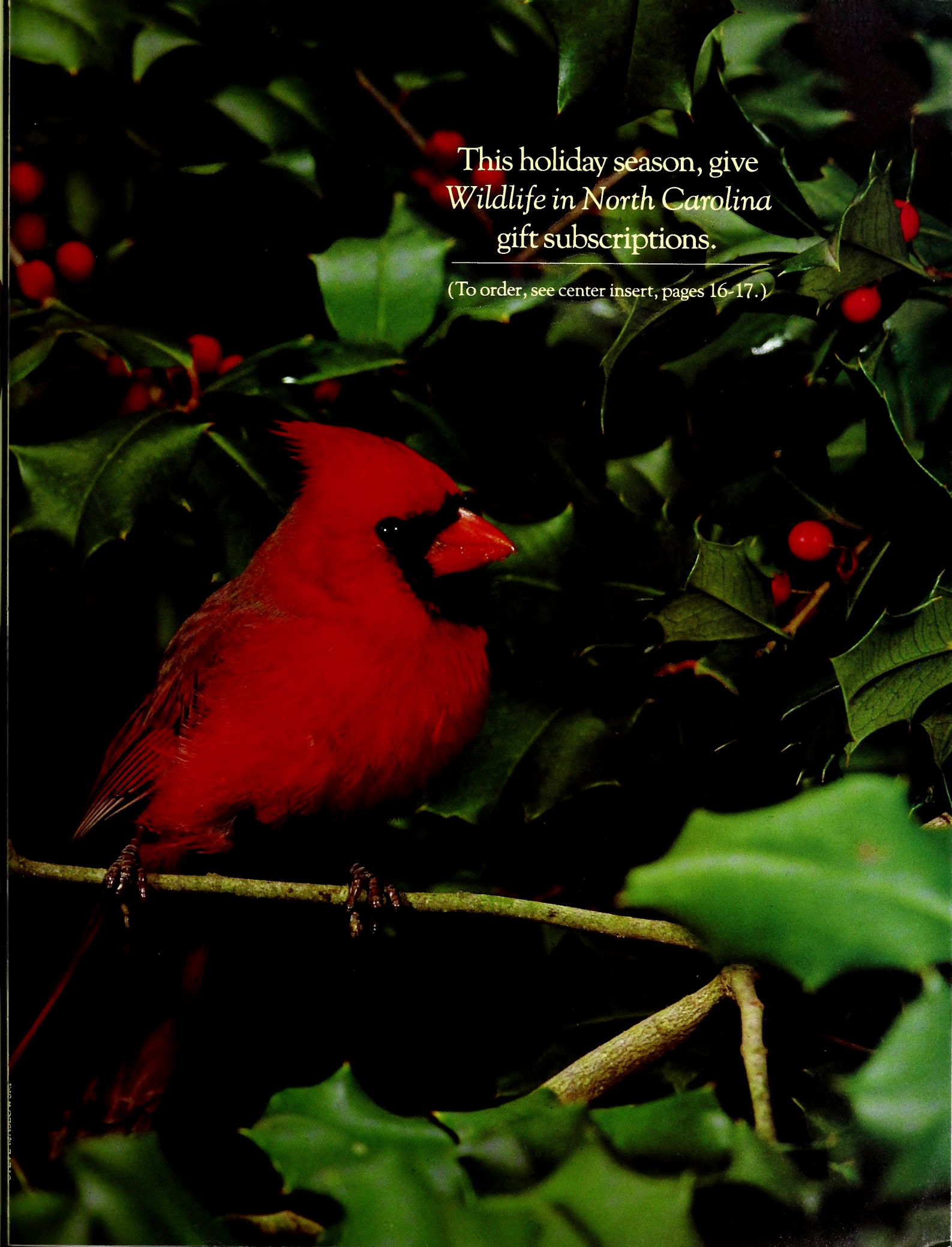
by Vic Venters

The cold bite of winter is almost here. Remember food and cover equals warmth—and survival—for animals in the wild. Leave them plenty of both.

Stay That Plow: One of the most effective things you can do around the farm to benefit wildlife is very simple. Just stay off the tractor and leave your stubblefields unplowed until early spring. The fall plowing of harvested grain fields of corn or soybeans removes much of the food wildlife species need during the colder months. Unless you've got a winter wheat crop to plant, there's really no need for fall plowing. Not only does disking under harvested fields rob wildlife of desperately needed winter food and cover, it also exposes topsoil to increased erosion from harsh winter storms. Leaving your crop stubble in the field until early spring will help wildlife, and will also maintain the fertility of your farm's soil.

Fruit Trees in Fall: November is a good time to plant fruit bearing trees such as dogwood and crab apple. As they mature, fruit bearing trees will provide a wide variety of wildlife species with natural foods. A fall planting allows the tree to become established before the winter months. It's also more pleasant weather to work in.

Warm Season What?: Although most planting is a season away, it's not too early to be thinking about introducing warm season grasses to your farm next spring. These native species, often called prairie grasses, prosper in the warm summer months and are an excellent summer livestock forage. They also provide great breeding cover for quail, rabbit and variety of other wildlife. Get a head start on the planting season by ordering a free copy of the new booklet *Warm Season Grasses For Virginia and North Carolina: Benefits To Livestock and Wildlife* from the Wildlife Commission. The booklet is a joint project of the N.C. Wildlife Resources Commission, the Virginia Department of Game and Inland Fisheries and Quail Unlimited. In it, you'll find information on benefits to livestock and wildlife, establishment, planting methods and rates, weed control, haying and burning schedules. For your copy, write the Division of Wildlife Management, Wildlife Resources Commission, 512 N. Salisbury St. Raleigh, NC 27604-1188.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(To order, see center insert, pages 16-17.)

Mitchell Majesty

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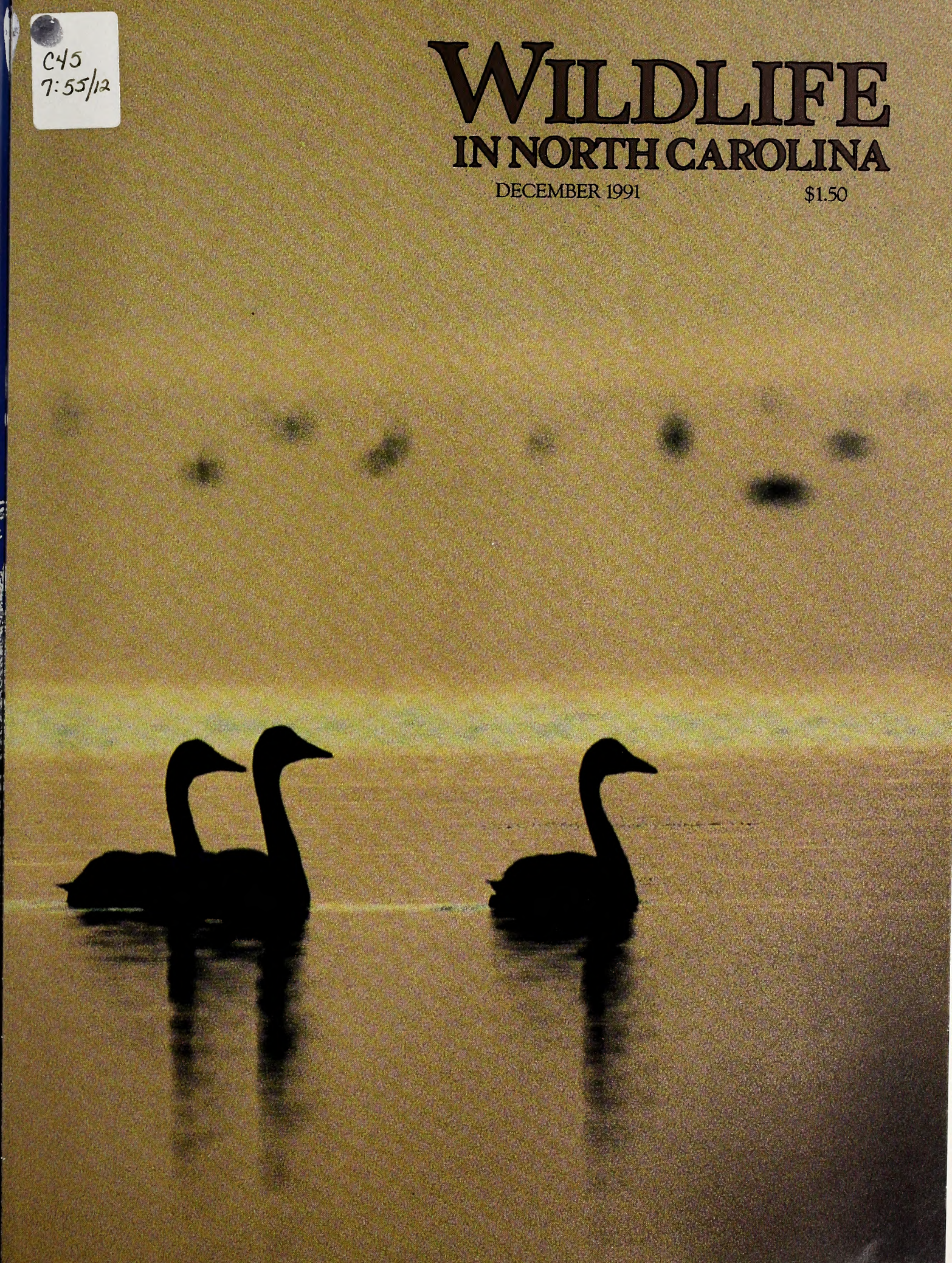


How To Shoot a Fruitcake

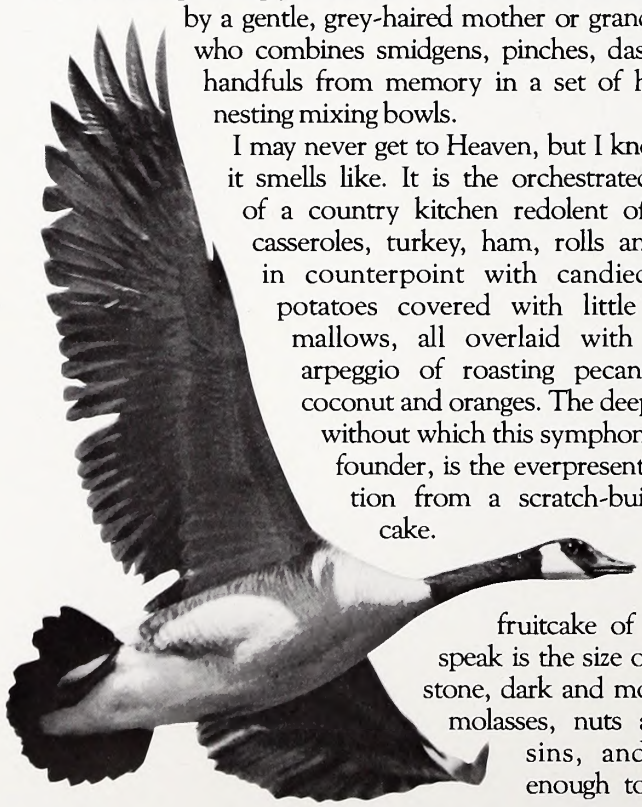
by Jim Dean

Somehow or other it has of late become fashionable, perhaps even politically correct, to make fun of fruitcakes. It's not clear why fruitcakes should be singled out for such high-octane abuse. We're not, after all, talking about drug addiction, but a simple Christmas tradition. Yet, it is clear that whole classes of society have developed a near-neurotic hatred of this dessert.

Celebrities famous for being famous seem compelled to hold press conferences to announce that they are not now, nor have they ever been, members of a group that might savor a slice. And is there a pundit anywhere who has not devoted a column to his or her militant anti-fruitcake stand? Could it simply be that columnists get stuck for subject matter this time of year and climb on the ban-wagon simply because they can't think of anything else to write about? Imagine that?

Hey folks, lighten up. This is beginning to fall into the same category as the silly, unending controversy over which is best—drip coffee or perked coffee.

Now that I've gotten that off my chest, let me take my apparently lonely stand foresquare in favor of the fruitcake. I suspect many of these people have never eaten a slab of the real thing lovingly fashioned from an old family recipe by a gentle, grey-haired mother or grandmother who combines smidgens, pinches, dashes and handfuls from memory in a set of heirloom nesting mixing bowls.



I may never get to Heaven, but I know what it smells like. It is the orchestrated aroma of a country kitchen redolent of baking casseroles, turkey, ham, rolls and gravy in counterpoint with candied sweet potatoes covered with little marshmallows, all overlaid with a light arpeggio of roasting pecans, fresh coconut and oranges. The deeper bass, without which this symphony would founder, is the everpresent emanation from a scratch-built fruitcake.

The kind of fruitcake of which I speak is the size of a millstone, dark and moist with molasses, nuts and raisins, and heavy enough to hold a schooner in a full gale. Indeed, a proper fruitcake should have the density of a black hole. And yes, it must include possibly carcinogenic maraschino cherries and those hard little green and yellow cubes of citron that stick in your teeth like jujubes. Flour is the glue that holds it all together, but I suspect it might nearly be optional. A slice can be be sawed off and eaten with sterling on a cut crystal plate, lugged into the den on a napkin, or pinched off in big, moist wads in the dark of the pantry. Most prefer it straight up, but it is sometimes served with a generous dollop of whipped cream—the real stuff, not Coolwhip, for Heaven's sake. If that doesn't bring your gastric juices to a boil, you're sick, sick, sick and should seriously consider seeking professional help.

While I'm on the subject of holiday gustatory traditions, it occurs to me that there are other seasonal staples that have likewise fallen on hard times. I know you will find it hard to believe, but there are people who have never eaten a piece of hot mincemeat pie with or without a scoop of homemade vanilla ice cream. Apparently, it is the presence of shredded beef in concert with various spicy fruits that has made true mincemeat as rare as a chestnut roasting on an open fire. You must not let such vital personal decisions be made by others. Taste it. Be confident. Is it not wonderful?

Remember scrapple? Is there anything more satisfyingly greasy for a holiday breakfast? Fresh ham? A slice of this uncured delicacy rimmed in white fat has become the rarest of all seasonal meats. While in the realm of swine, you should not neglect crackling biscuits, and in case you've momentarily forgotten, cracklings are pork fat fried until they crumble, at which point they are added to the dough before the biscuits are baked. As long as we're at it, biscuitwise, permit one other indulgence—real butter. Who knows, who really knows, what's in margarine anyway? For all you know, it could have been what spilled from the *Exxon Valdese*.

There were a few other seasonal foods that sometimes played a part in our family tradition. In the 1950s and early '60s before the vast flocks of Canada geese switched their wintering allegiance to the Eastern Shore of Maryland, we would leave shortly before Christmas Eve to hunt at Lake Mattamuskeet.

Stuffed with an oyster fritter breakfast, we would shiver in the blind as dawn broke blood-red over the ice-rimmed lake. As distant Vees of honking geese winged to the fields to feed, and the decoys bobbed invitingly, we would eat parched peanuts and drink steaming coffee knowing that, with any luck, Christmas dinner would include roast goose and giblet gravy. And fruitcake. Always.

December, 1991
Volume 55, Number 12

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WILDLIFE IN NORTH CAROLINA

Wildlife in North Carolina is the official educational publication of the North Carolina Wildlife Resources Commission and is dedicated to the sound conservation of the State's wildlife and other interrelated natural resources.

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illustrated by Jackie Pittman ©1991
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Her presence was so void of intrusion it was almost a suggestion, yet so impelling it became the mirror of our passage.

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Wildlife Through the Year *by Vic Venters*

Cover *On a windless evening, tundra swans rest at Lake Mattamuskeet, one of their favorite wintering grounds. Photograph by Larry Ditto.*

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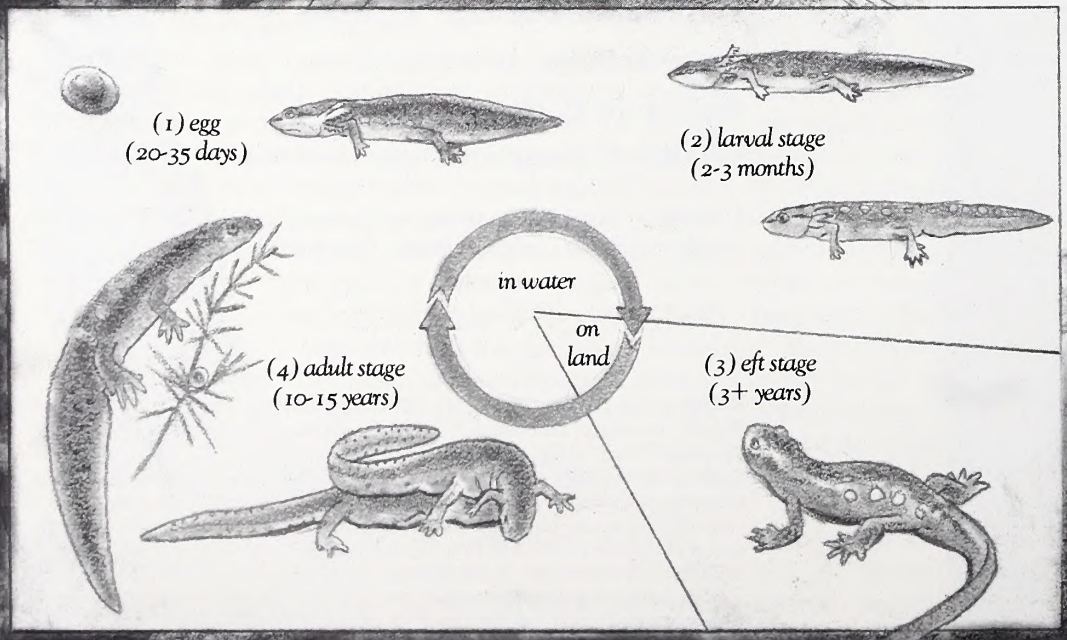
The Eastern newt *is a member of the Salamandridae family which contains many of the common salamander species. About 40 species of newts are found worldwide, although only two of them occur in North America and one in North Carolina. The adult newt is about 3½ inches long.*



Newt eggs hatch *after 20 to 35 days (1). The aquatic larva breathes through gills, sports a fin along the back and tail and slowly develops feet (2). As a juvenile (3), the colorful newt (also called an eft) is a terrestrial creature. After several years, the eft enters the pond, changes its shape once again and resumes its aquatic life (4).*

Back to the Pond

written by Lawrence S. Earley / illustrated by David Williams

The salamanders are stirring. As the planet tilts away from the warming influence of the sun, many wildlife species have slowed their movements or even stopped them altogether for a few months. Not the salamanders. Improbably enough, winter is the time when many salamanders move from their terrestrial habitat to pond habitats where they'll soon be engaged in breeding activities.

For the mole salamander or the tiger salamander, this migration is an annual event. But for the newts among the pond-bound amphibians, it's something novel, something entirely new. The biological imperative that drives them toward a pond is triggered only once in their lives, and once in the pond, they are never quite the same.

North Carolina's only newt species, the Eastern newt (*Notopthalmus viridescens*), has an improbable life history marked by two, not just one, transformations. It spends the first months of its life as an aquatic larva, dodging predators, including adult newts, and putting on heft and length. It has gills, a fin running along the back and tail, and feet that are just buds when it is a small larva. Then in the late spring or summer, if it hasn't been eaten, it crawls out of the water with feet, a finless tail, lungs and a yen for terra firma.

This juvenile newt, called an eft or a red eft, will change its venue from pond to land for up to three or four years. You can't miss it in the moist, mossy areas that it likes: its brilliant reddish-orange coloration and vermilion, black-rimmed spots make it one of the most visible of all salamanders. (The eft stage of the Coastal Plain subspecies is a reddish brown.) The eft has so little natural camouflage that you may wonder how it avoids being eaten. Its defense lies in its terrible taste and skin toxin—predators learn to stay away not only from this one but from some other salamander species that resemble the eft.

One winter's day, heeding a new biological signal, the eft moves gradually toward a pond where it will undergo another transformation. It keeps its spots, but now its coloration is a dull green and its tail has thickened into an aquatic fin. It's got breeding to do. Over the next several months, the female lays several hundred eggs one at a time, wrapping each one in a leaf or attaching it to submerged plants.

From now on—the adult newt lives for 10 or 15 years—the newt is almost totally aquatic. Like many salamanders, newts have to cope with ponds that may dry out for several months during the year. When that happens, the adaptable adult newts are forced to seek refuge on land, a terrain that they are not well-suited for now.

But this is only one way that they reveal their tenacious survival instincts. So adaptable are they that they may cling to their eft youth if there are no ponds in the neighborhood. And, in more permanent ponds that offer plenty of food, newts can forego the eft stage altogether, growing into large larvae and eventually transforming directly into adults. They may even keep their larval gills for a while.

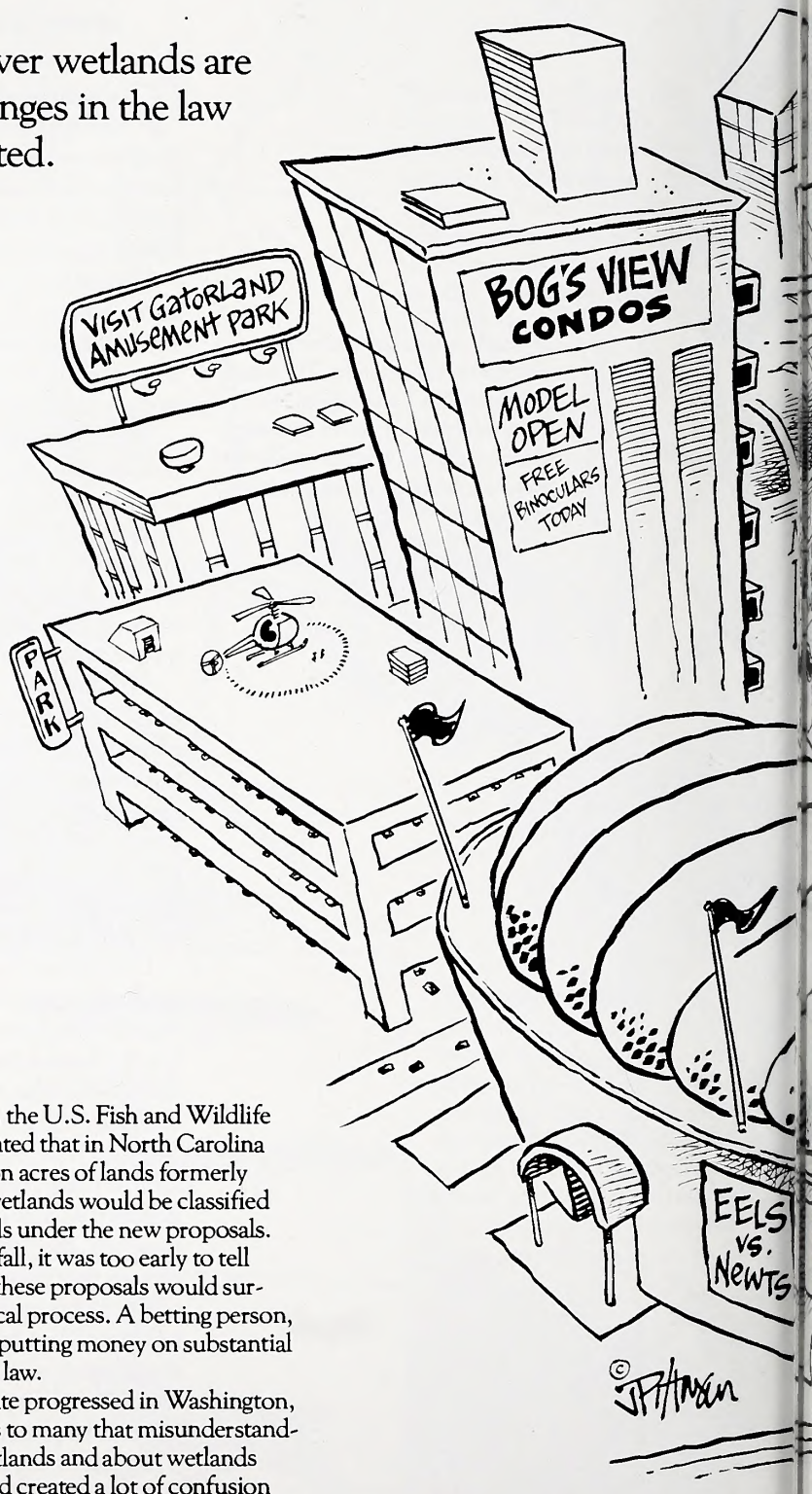
Newts are found statewide and are much more adaptable than another salamander, the tiger salamander (See "The Tiger Salamander," February 1990), which is confined to fishless ponds in the Coastal Plain. Newts do fine in ponds with fish, as long as there's plenty of vegetation, but you'd have expected that, wouldn't you? ⊡

Female newts lay their eggs *singly over many months. The female newt may attach several hundred of the tiny (about 1.5 mm in diameter), spherical eggs to plant stems. She may even hide her eggs by wrapping them in leaves.*

Seven Myths about Wetlands

Half truths and misconceptions over wetlands are contributing to the sweeping changes in the law now being contemplated.

by Lawrence S. Earley



In a season of fire storms, this one took a lot of people by surprise. While Operation Desert Storm mopped up in the Iraqi desert, a tumultuous political debate erupted in Washington over an equally formidable terrain—wetlands. Wetlands may have once been a subject reserved for biologists, but now lawmakers were fencing over such questions as "What are wetlands?" and "How do you know when you're in one?"

By summer's end new and controversial answers to these questions had been proposed by the White House, and Capitol Hill bristled with a host of bills that would scale back wetlands protection. Among the most controversial proposals were:

- A revision of the methods for identifying wetlands that would reduce the acreage under regulation.
- A system that would rank wetlands according to their values as "high," "medium" and "low" wetlands, freeing low-value wetlands from protection.
- A requirement that the government purchase any wetland it classified as "high-value."
- The elimination of current guidelines that require landowners to look for non-wetland alternatives before a permit can be issued to develop in a wetland.
- The elimination of the U.S Environmental Protection Agency's role in wetland regulation and the granting of all authority to the U.S. Army Corps of Engineers.

Pro-development interests were heartened by the proposed revisions, saying that the new rules would make it easier to develop in wetlands and eliminate many seasonally dry wetlands or even non-wetlands from regulation. Others claimed that the proposals would further erode regulations that were already allowing wetlands losses of hundreds of thousands of acres annually.

In October, the U.S. Fish and Wildlife Service estimated that in North Carolina alone, 2 million acres of lands formerly identified as wetlands would be classified as nonwetlands under the new proposals.

As of early fall, it was too early to tell how many of these proposals would survive the political process. A betting person, however, was putting money on substantial changes in the law.

As the debate progressed in Washington, it was obvious to many that misunderstandings about wetlands and about wetlands regulations had created a lot of confusion nationwide. A relentless procession of witnesses testified before Congressional panels about the unfairness of Section 404 of the Clean Water Act, one of the nation's strongest regulations controlling develop-

A Cartoonist Looks at Wetlands: Illustrated by Jackie Pittman©1991

ment in wetlands. Witnesses were especially upset about the methods used by federal officials to identify wetlands and set forth in an infamous federal document, the 1989 *Federal Manual for Identifying and Delineating Jurisdictional Wetlands*. Cases were cited of farmers who couldn't harvest their corn, widows who couldn't cut roses from their gardens, and senior citizens barred from building on property they had purchased for their retirement years—all because of wetlands regulations.

Was it really the little guy who bore the brunt of wetlands regulations? Sen. John Chafee (R-RI), ranking Republican on the Senate's Environment and Public Works Committee and a strong supporter of wetlands, didn't think so. "If you counted on anecdotes or newspaper clippings for your background information, you might conclude that the 404 program was aimed solely at elderly immigrants, struggling farmers and low-income housing projects," said Sen. Chafee in a speech last June. "Let me assure you that is not the case....Developers of shopping malls and commercial real estate are more typical permit applicants."

Let's examine the facts obscured by seven other misconceptions about wetlands.

Myth No. 1: Almost all land east of I-95 is wetlands, according to current definitions of wetlands.

There *are* a lot of wetlands in eastern North Carolina, but not that many. No one has an accurate estimate of the regulated wetlands acreage east of I-95. One study by the N.C. Coastal Resources Commission has produced preliminary data showing that the figure would most probably be well under these numbers. According to James Wuenscher, a program analyst with the CRC, hydric soils—soils characteristically found in wetlands—are present on only about 52 percent of the land area of the 20 coastal counties covered under the Coastal Area Management Act. The presence of hydric soils is one of the criteria used to identify wetlands," says Wuenscher. "If the estimate of hydric soils of 52 percent is accurate at all, then that is a ceiling for wetlands."

Even this figure may almost certainly prove to be too high. That's because the presence of hydric soil is only one of three criteria required for a site to be regulated as a wetland by federal agencies. The *Manual* requires biologists also to look at how saturated the soil is and whether characteristic wetland vegetation is growing on the site. Many areas in eastern North Carolina have hydric soils but they have been drained to the point that they no longer qualify as a wetland and are no longer considered as such.

In addition, many wetlands in eastern North Carolina have been specifically exempted from the protection afforded by Section 404 because of ongoing farming or forestry operations. "A lot of the farmland in Eastern North Carolina has hydric soils, and much of that farmland is exempt from 404 regulation," says Wayne Wright, chief

of the regulatory section of the Corps of Engineers in Wilmington. For the purposes of the regulations, these lands are not even considered wetlands. "That would lower the figure of regulated wetland well below that 52 percent figure," says Wright.

Wright confesses that he might have inadvertently been the source of these inflated figures. In a talk last year to a group of North Carolina developers, Wright was asked to put a figure on the amount of wetlands east of the highway. "I said that if you took the broadest definition of a wetland, then possibly as much as 60 to 70 percent of the land east of I-95 could be called a wetland," said Wright. "I went on to qualify that, but of course no one listened to that. I said that we didn't administer the 404 program according to this broad definition, that our definition was somewhat more restrictive. I also noted that that was a figure applied to undeveloped lands east of I-95, not to the entire Coastal Plain."

Myth No. 2: Under current rules, every mud puddle could qualify as a wetland. Only wetlands with standing water have ecological value.

Of all wetlands issues, this one is the most confusing and the one that stirs the most passions. Many property owners often can't tell a wetland from a nonwetland without an expensive consultant, and even then there can be disagreements about the wetland boundaries. Common sense might suggest that wetlands ought to be plenty wet to fit the category, yet common sense isn't the best guide.

Many shallow depressions in the prairie pothole region of the country are bone dry for months on end, but when the snow melts the flooded potholes are full of invertebrates and other foods important to migrating waterfowl. North Carolina's extensive pocosins are also dry seasonally, but they perform important services by absorbing excess water and releasing it slowly. Bottomland hardwood swamps adjoining river systems are generally thought of as among the wettest of wetlands, but the second terrace up from the bottoms may be dry much of the year and may not be inundated at all, except during the biggest flood events. Yet that's where the oak trees grow for wood ducks, turkeys, whitetailed deer and numerous other wildlife. That's where many animals go to seek cover.

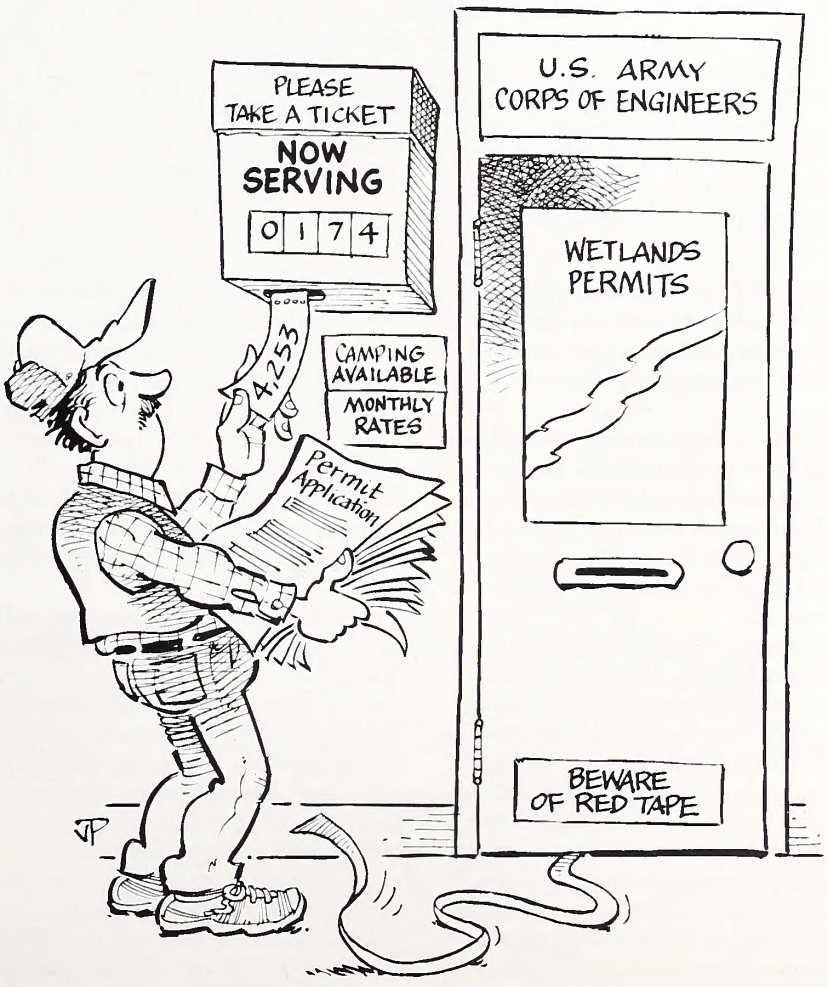
Hydrologists say that many seasonally dry wetlands have the greatest importance in controlling floods because they hold water precisely when it needs to be held, during floods. The drier they are when heavy rains occur, the more water they can absorb.

"Seasonally dry" wetlands also tend to be places with the greatest abundance of rare plants and animals, says Alan Weakley of the state's Natural Heritage Program. Wet longleaf pine savannas, a wetland type that will probably be eliminated from protection under the new proposals, support more rare and endangered plants and animals than any other ecosystem in the state. Says Weakley, "Since they're drier and thus more like uplands, they've suffered from more exploitation. There's not much you can do with a cypress gum swamp that's flooded 6-feet deep much of the time, but ditches can lower the water table in a savanna sufficiently to convert it to another use. And that's happened a lot, which makes the savannas we have so rare."

Myth No. 3: Once my land is determined to be a wetland, I can't use it any longer. My property is worthless.

There's no doubt that for some landowners, wetlands regulations have meant a loss of some or all development potential. Yet there's a lot of confusion over what rights are actually lost. In a letter to his constituents, justifying his support for H.R. 1330, one of the so-called "reform" bills before Congress, one North Carolina congressman cited the case of a landowner who bought an old farm 20 years ago to grow a crop of pine trees. If this property is identified as a wetland, the owner might be prevented from harvesting and reseeding his pines, wrote the congressman. The value of the property has been diminished.

"That's not accurate," says Wright, of the Corps of Engineers. "If he bought his land with the intent to grow timber, and could demonstrate improvements that he had made to enhance his timber production, then there's every chance he would be able to harvest his timber. Even if his land is a wetland today, if all the owner wanted to do was harvest his trees and replant them in pine trees, that's considered normal silviculture and is exempt from Section 404." No permit is required. Nor is a permit



needed to build a road to harvest the timber, as long the road doesn't convert the wetland to a non-wetland and as long as it complies with best management practices.

Myth No. 4: Farmland identified as a wetland can't be farmed any longer.

Not necessarily. Two laws relate to agricultural activities in wetlands: Section 404 of the Clean Water Act and the so-called "Swampbuster" provision of the 1985 and 1990 farm bills.

Normal agricultural activities have been exempt from 404 regulations since 1977. And even when a planned activity is not exempt from these regulations, the law does not prohibit you from that activity—it says you must apply for a permit from the Corps of Engineers. If you can show that there is no practical alternative to your project, or that it will have a minimal impact on wetlands, your chances of getting a permit are quite good. In fact, of the 15,000 permit applications reviewed by the Corps each year, only about 500 permits (3 percent) are denied.

The Swampbuster provision says that farmers who convert a wetland into cropland will lose their federal farm subsidies. Even here there are exemptions, for "prior converted" cropland, or wetlands that were converted from wetland before 1985 and no longer exhibit all the features of a wetland. Swampbuster states that the American people, recognizing the value of wetlands, will not subsidize their conversion by farmers.

Myth No. 5: Low-value wetlands are given the same protection as high-value wetlands.

Developers are especially outraged when an acre or two of scrubby wetland threatens to stop a shopping mall project. An acre of degraded wetland isn't as valuable as an acre of high-value salt marsh, they say, yet it's given the same protection.

To a certain extent, wetlands are distinguished according to their value during the permit-review process required by Section 404. Though it is time-consuming, especially when the project is controversial, this process is a system of checks and balances. The fact that you have a wetland does not automatically prevent you from getting a permit to develop it. Most conservationists wish it did, but the truth is that the Corps of Engineers takes comments from all sides, weighing environmental protection of the wetland against the economic and community benefits of a project. This process considers the value of the affected wetland. "If everyone agrees that the wetland has minimal values, the Corps will issue the permit," says Ronnie Haynes, of the Atlanta office of the U.S. Fish and Wildlife Service. "They do it every time."

Myth No. 6: Wetlands regulations are too rigid.

Some might argue that they are too flexible. The Coastal Area Management Act contains the only state rules relating to wetlands, and they only pertain to 20 coastal counties, not even the entire Coastal Plain. Section 404 of the Clean Water Act contains the only *federal* regulations protecting wetlands, yet these regulations are full of loopholes. The regulations only cover the discharge of dredge or fill material into wetlands, but plenty of wetlands losses—as much as 80 percent, according to the U.S. Fish and Wildlife Service—have come about through operations that are perfectly legal and unregulated:

- Although the Corps of Engineers has recently been discouraging this, draining, excavating, clearing or channelizing wetlands are activities not prohibited by the law.
- Normal forestry and farming operations in wetlands are exempt from wetlands regulations.
- Permits are routinely granted for highways, marinas and other projects that degrade wetlands. Twenty-six nationwide permits expedite or automatically approve projects that are judged to have minimal effects on a wetland. One of them allows wetlands of less than an acre to be filled without a permit as long as they are above the headwaters point on a stream, or are isolated wetlands. Wetlands projects between one and 10 acres in size require only an abbreviated review. About 40,000 of these projects per year are allowed under nationwide permits.

From the 1950s to the 1970s, annually over 450,000 acres of wetlands were drained, converted or otherwise destroyed, reports the Fish and Wildlife Service. Since then, the average has dropped to 290,000 acres a year and of this figure, only 40,000 acres were due to permits granted under Section 404. The rest—a quarter of a million acres a year—was lost because of projects lying outside the scope of 404 regulations.

A truly stringent—and effective—wetland law is needed. It would broaden the protection of wetlands, not shrink it. But Section 404 isn't that law.

Myth No. 7: Wetlands regulations are costing North Carolina billions of dollars in economic development.

Estimating the economic costs of wetlands protection is complex, for such calculations often leave out the economic benefits of intact and functioning wetland systems. "It's hard to measure the economic value of a wetland in terms of its protection against floods or hurricanes," says Ronnie Haynes. If a wetland is destroyed to make way for a development, and then the project is in turn destroyed by a hurricane or a flood, the taxpayer pays twice—in disaster relief and in the loss of the benefits of the resource, the wetland.

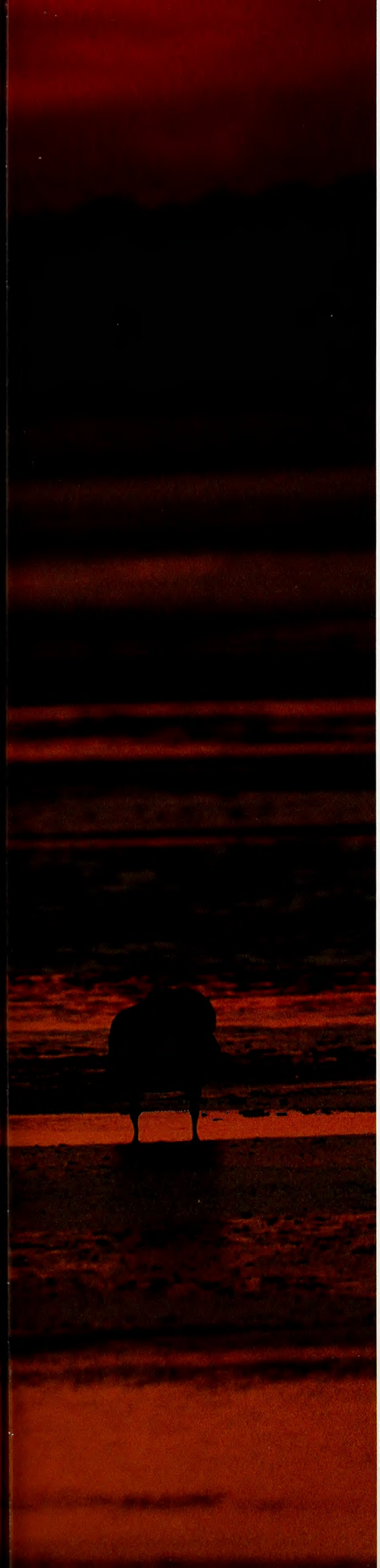
Last August, one North Carolina pro-development group estimated the economic effects of wetland regulations on four coastal counties. The cost was astonishing: losses of $56 billion, in terms of lost development opportunities for landowners and lost tax revenues for counties.

The estimates suffered from some improbable assumptions. The N.C. Environmental Defense Fund pointed out that the figures were based on the dubious assumption that if Section 404 didn't exist, all undeveloped land with hydric soils in these four counties would be developed. Citizens of these counties might argue that that's not the future that they'd had in mind for their counties. The group's estimates also ignored the probability that some of these undeveloped areas have been drained at some time in the past and so would not be protected by Section 404 (See "Almost all land east of I-95 is a wetland" above). Also, Section 404 is so "leaky" that many permit applications to develop these lands would no doubt be approved (See "Wetland protection regulations are too rigid" above).

The fact remains that despite wetland regulations, five of the six fastest growing counties in the state during the 1980s were wetlands-loaded coastal counties.

In all fairness, it ought to be pointed out that many misunderstandings over wetlands regulations might have been prevented. If the government had made it clearer what landowners could do or not do on their wetlands property, perhaps there'd be less animosity over the regulations. Yet much of the confusion also derives from the different values that we attach to wetlands, and value is a choice we make. Do we choose to value wetlands only for their real estate value or for the crops they could grow? Or do we admire a diversity of wetland types for the remarkable plants that are adapted to them, for the wildlife they support and the hidden services they perform?

These are our choices and how we choose says much about the society that we are today and are creating for the future. ☒



LARRY DITTO

No Sad Songs for Swans

Wintering tundra swan populations are still growing in North Carolina, but Arctic oil development may someday pose a threat.

by Vic Venters

In the early 1970s, biologists studying neck-banded tundra swans on their traditional Chesapeake Bay wintering grounds noticed unusual changes in the birds' behavior. Swans began feeding in harvested grain fields, abandoning their heretofore exclusive aquatic weed diet. Then, individual birds that had previously spent their winters in Maryland began appearing in North Carolina. This was odd because swans, long-lived birds, have a strong affinity for wintering in the same location year after year. Concurrently, biologists noticed a slight decline in the number of swans on the Chesapeake Bay wintering grounds and a jump in North Carolina's wintering population.

It was the beginning of a major shift for wintering tundra swan populations, a trend very much in evidence today when federal wildlife refuges in North Carolina such as Mattamuskeet literally turn white with tremendous concentrations of swans in December. Today, North Carolina winters more swans than any other state in the nation—averaging 60,000 to 70,000 per year—and the population continues to grow.

The tundra swan's return to North Carolina and elsewhere really dates from 1918, when the newly passed Migratory Bird Treaty Act gave total protection to a population that had been decimated by the plumage trade for women's fashions and unregulated sport and market hunting. Fortunately, the tundra swan's Arctic breeding grounds—on the north face of Alaska and in Canada's vast Yukon and Northwest Territories—remained virtually unpopulated and untouched by human hands.

With breeding grounds secure, tundra swans were able to rebound under protection afforded by the law. By the late 1940s, the continental swan population was increasing slowly but steadily. By the mid-1950s, the continental population had risen to about 78,000, and by the 1960s the population was passing the 100,000 number. The latest published figures (1991) put the continental tundra swan population at about 145,000 birds.

Biologists recognize two distinct groups of tundra swans in North America: the Eastern population and the Western population. The Western population—about 47,600 today—winters largely in California, but some birds also winter in Utah, Nevada, Oregon and Washington.

The Eastern population's traditional Chesapeake Bay wintering grounds still hold a considerable number of birds, about 25,000. Most are concentrated in Maryland, followed by Virginia, New Jersey, Pennsylvania and Delaware. Today, however, the major portion of the Eastern population spends its winter in the northeastern region of North Carolina.

While North Carolina has always been a wintering ground for tundra swans, it was a secondary habitat compared to the Chesapeake. In 1961, for instance, the 16,800 tundra swans that wintered in the state represented about 27 percent of the

***North Carolina now winters** more tundra swans than any other state. Unlike many waterfowl species, the continental population of tundra swans continues to grow—thanks to their adaptability and untouched breeding grounds.*

Atlantic Flyway population. On the other hand, the 65,000 birds that wintered here in 1990 represented over 72 percent of the Atlantic Flyway's population.

During the past 25 years, the Eastern population of tundra swan has increased about 50 percent on the Atlantic Flyway—up from about 60,000 to 90,000 birds. Given this, the increases seen in North Carolina represent not only a population shift from northern states, but an actual population growth, as well.

But why here?

Our state's good habitat and abundant food are the main reasons. In years past, tundra swans fed almost exclusively on the leaves, stems and tubers of aquatic and marsh plants. Chesapeake Bay was rich in aquatic plants, at least until the cumulative effects of 300 years of human settlement began to catch up with the once-noble waterway. As pollution began to destroy the Chesapeake's vast aquatic grass beds in the 1960s and '70s, tundra swans began feeding in the grain fields on the Eastern Shore—just as Canada geese did.

Unlike most of the geese, however, many tundra swans also began migrating farther south, most likely lured by the Tar Heel state's still abundant aquatic vegetation and huge grain fields—particularly the vast winter wheat fields found in northeastern counties.

Swans have always been fond of Lake Mattamuskeet's plush aquatic weed beds, but until the late 1960s birds appeared only in small numbers at Pungo and Pea Island wildlife refuges. After 1976, swan numbers began to rapidly increase at all three refuges.

The majority of tundra swans wintering in North Carolina spend much of their time on the three federal wildlife refuges in northeastern part of the state; Mattamuskeet, Pocosin Lakes (formerly the Pungo Refuge) and, to a smaller extent, Pea Island on the Outer Banks. Because the majority of these refuge areas are closed to human disturbance such as boating and hunting during the winter, the shallow natural lakes at Pocosin Lakes and Mattamuskeet offer excellent roosting and resting areas, while the huge winter wheat and corn fields surrounding the refuges offer plenty to eat.

Lake Mattamuskeet, in particular, is a swan haven. In addition to surrounding wheat fields, the refuge lake also offers abundant natural aquatic foods. In 1990, for example, 45,000 birds wintered on the lake, 50 percent of the Atlantic Flyway population. The past several years have also seen higher swan populations at Pungo Lake in the Pocosin Lakes Refuge. Each year, federal biologists plant about 1,300 acres of grain in surrounding fields at Pocosin Lakes refuge for specific use by waterfowl.

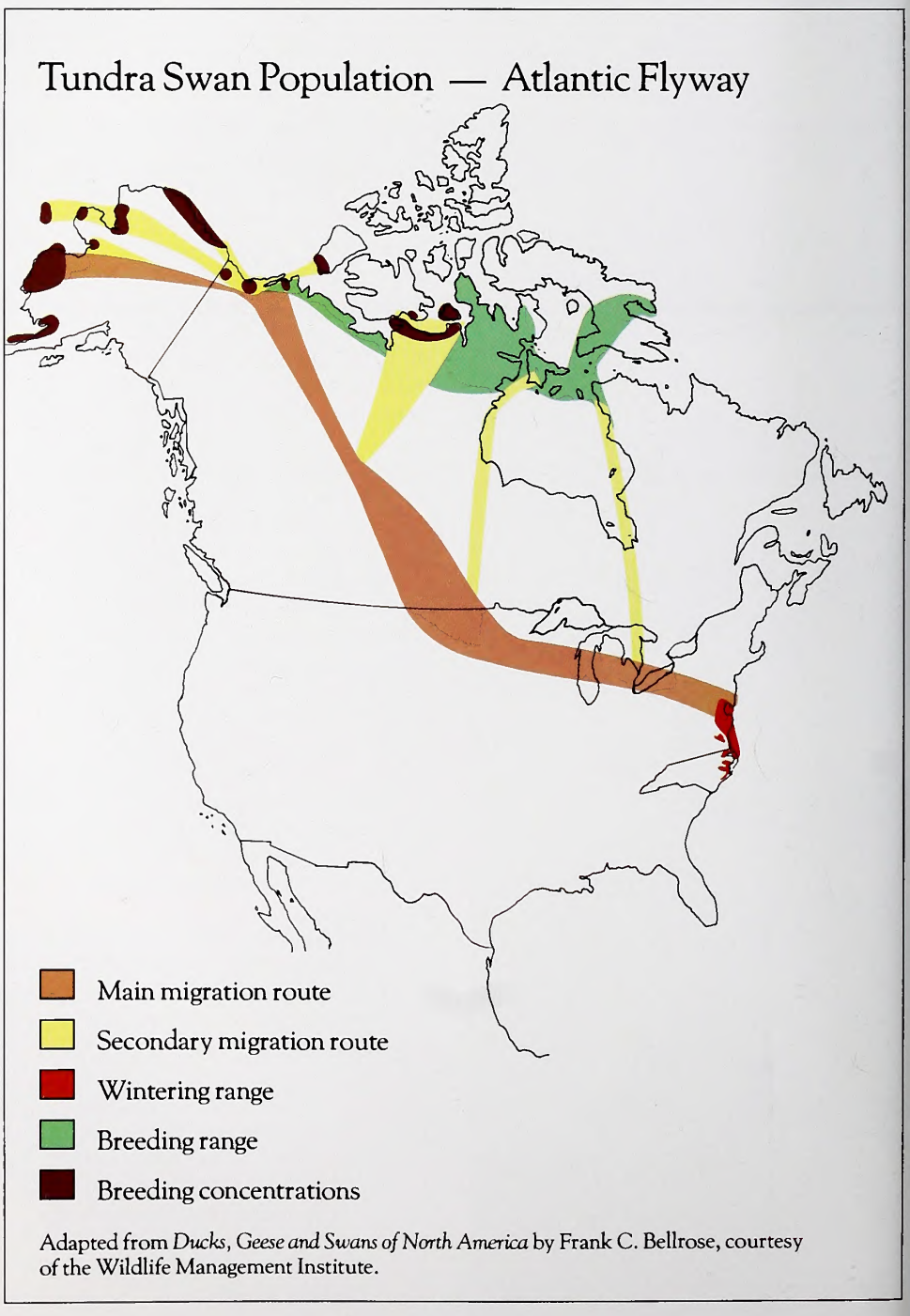
The population recovery of tundra swans has been so dramatic that North Carolina has offered a limited hunting season—permit only—for the past seven years.

Although limited harvest of tundra swans—about 1,200 birds per year—had been allowed in Utah and Nevada since 1962, the season had remained closed on the Atlantic Flyway. As the Eastern swan population increased in North Carolina in the late 1970s, waterfowlers began to take note and ask that a swan season be reopened. Some area farmers also experienced crop depredation and asked for a season to relieve pressure on their crops.

***Few sights in nature** can rival the beauty of tundra swans on the wing. The vast majority of swans that migrate here winter around the federal wildlife refuges in the northeastern corner of North Carolina.*

At first wary of a public relations backlash from the non-hunting public, and lacking the necessary population data to justify large-scale hunting nationwide, the U.S. Fish and Wildlife Service was reluctant to open a swan season for Atlantic Flyway birds.

Then, in 1984, with the swan population



Adapted from *Ducks, Geese and Swans of North America* by Frank C. Bellrose, courtesy of the Wildlife Management Institute.

LARRY DITTO

***Hungry tundra swans** (left) swoop into a field of winter wheat to feed. These huge grain fields provide swans with an abundant source of food in cold winter months. This resting swan (right) was photographed at Mattamuskeet National Wildlife Refuge, a favorite wintering area for these birds.*

still growing, the Fish and Wildlife Service authorized the N.C. Wildlife Resources Commission to open an "experimental" tundra swan season with harvest strictly controlled through a limited number of permits. In North Carolina's first season, 1,000 permits were issued, a number that has since risen to 6,000 per season. Since 1984, the U.S. Fish and Wildlife Service has also allowed limited (permit-only) hunts in Virginia and several other states that serve as staging areas for swans along their migratory route.

The biological rationale for allowing limited hunting on the Eastern swan population is to maintain a very low harvest. The number of permits issued is calculated to be 10 percent or less of the wintering Atlantic Flyway population. In actuality, the legal harvest has never even approached 10 percent and is instead only about 3 to 5 percent each year.

In the six seasons since North Carolina has been issuing 6,000 permits per year, about 4,500 to 5,000 of those permit holders report hunting each year, taking on an average about 2,500 to 3,000 swans per year—again, 3- to 5-percent of the state's wintering population. In other words, a very conservative harvest.

While the hunting season has been popular with many waterfowlers, it has not gone completely unchallenged. There was predictable opposition to opening the season from the anti-hunting movement, but also flak from some bird enthusiasts and swan researchers. For the most part, this opposition to limited, permit-only swan hunting was, and is, largely based on aesthetic and ethical considerations, rather than on biological concerns.

The U.S. Fish and Wildlife Service and involved state wildlife agencies point out that the swan is a "traditional" game bird just like other waterfowl species, and with populations healthy and growing, there's no reason not to allow at least a conservative harvest.

Most important, they point out, the limited harvest has not hurt Eastern tundra swan populations—their numbers continue to expand at about 2 percent per year, and actually exceed the population level goals set by the U.S. Fish and Wildlife Service. The light hunting pressure has made swans more wary of hunters, but has not chased them out of refuge areas where they can be easily seen by non-hunters and birding enthusiasts, as any winter visit to the Mattamuskeet or Pocosin Lakes refuges will attest.

What everyone agrees on, however, is that additional data collection is desirable prior to expansion of any swan hunting seasons. Because of increased interest for opening seasons in some states through which swans migrate, the U.S. Fish and Wildlife Service and researchers from the North Carolina Cooperative Fish and Wildlife Research Unit are planning to conduct a joint five-year project that will help determine whether or not the swan harvest can be safely expanded without harm to the population. "We feel comfortable that current swan hunting seasons are justified, based on available information," said Dennis Luszcz, the Wildlife Commission's chief waterfowl biologist. "Should wildlife agencies decide in the future to liberalize swan regulations, the additional population data will be needed."

There are several biological considerations that make a conservative harvest necessary until more is known. Like Canada geese, tundra swans have distinct local populations that migrate along the same routes and return to the same areas year after year. Also, tundra swans do not have as high a reproductive rate as many other waterfowl species. It takes a very long time—up to five years—before adult swans become successful breeders.

Truth is, *properly* regulated sport hunting is the least of the tundra swan's concerns. Habitat destruction is the real sword that hangs over any wildlife species, game or non-game. Currently, swan breeding habitat is still remote and unsettled, and the bird's adaptability on its wintering range bodes well—for now. Unfortunately, a booming human population and subsequent development in coastal areas continues to nibble away at wintering habitat. Even so, the presence of protected wildlife refuges and large agricultural areas mitigate some of that problem. It's up North, in the Arctic breeding grounds, where a disaster may arise.

"The biggest potential threat on the breeding grounds is oil development and exploration, particularly on the North Slope," said Roland Limpert, a research biologist with Chesapeake Wildlife Heritage, a group that has banded and studied swans for years. "Although the breeding ranges of the tundra swan are extensive, breeding concentrations are few and located primarily in vulnerable river deltas."

"Because of the geology, river deltas are also prime sites for oil development," Limpert elaborated. "You've got one of the major breeding sites in the North Slope in the Colville River delta, right at the edge of the Prudhoe Bay oil field. There is a push going on to open this area and start pumping. If this happens, roads, development and an increasing human population will follow."

Given the nation's current energy policy, which stresses oil exploration and development over conservation, a push into the tundra swan's virgin breeding habitat seems sadly possible, if not necessarily imminent. If that happens, we'll soon find out if oil and swans mix any better than oil and water. For their sake, let's hope so. ⊠

SQUAW

Her presence was so void of intrusion
it was almost a suggestion, yet so impelling
it became the mirror of our passage.

written by Mike Gaddis ©1991
illustrated by David Williams ©1991

To every end, there is a beginning. For this we should be thankful. The journey back is usually pleasant.

My first recollection of Squaw does not find her among hip boots, guns and decoys, as it might, but in a sandbox with my 2-year-old daughter, Melanie. I see Squaw's pug nose and the elfin highlights in her eyes as she sits splay-legged and pot-bellied, contemplating mischief, while her playmate works with great purpose to bury her front paws. Though it is about to suffer a juvenile setback, a tolerant patience is growing. It will become her staunchest trait. But for now, havoc prevails. Sharp teeth give a coat sleeve a good rough-housing. The child squeals wildly, and the black puppy backs and whirls like a wind-up toy. Mid-afternoon finds two small souls lost among the blankets, whimpering in unison, chasing separate dreams of things to be. A sibling bond is being forged. It will last both lifetimes.

Squaw was friend and guardian before she was field dog, especially to my daughter, and she took the one role as seriously as the other. She shadowed Melanie relentlessly, harassing the caterpillars, fire trucks, ponies and other tag-alongs perennially in tow, cavorting and growling defiantly at the incessant scolding she incited. The high deck on the south side of the house was threatening to a child and Squaw stayed in a nervous frenzy when we were there, placing herself between Melanie and the edge. At a gangly four months she was gentle and submissive by nature, but became demonic in the vet's office when a mature doberman was perceived as a menace to my wife, Loretta, and to Melanie. With bristling hackles, barred teeth and ominous warnings, she planted herself between them and the larger dog. The dobe backed off. In later years, she would instill the same respect in uninvited strangers who found their way to our door. Dogs are very good judges of human character. If Squaw was uneasy with someone, we were also.

Amidst her domestic responsibilities, I worked in a bit of field training, suffering my daughter's indignation over the monopoly of her playmate. Squaw proved a joy to train. There was progress with every session and it came fast. She learned "sit" in a half-day, both voice and whistle command, and never forgot. At the end of a week, she would "stay" while I circled the house. "Come" was natural. Basic hand signals took about two months. She had a strong water entry and marked thrown dummies well, both on land or water. We were on the way. Soon, she was handling multiple retrieves on the dummies with ease, and then feathers. She lived for tethered pigeons and mallards, and her return was soft and direct. When she heard the gun for the first time, she was a polished dog on "yard work." By the end of her first gunning season, she was reliably steady to wing and shot.

Like most of us shackled souls who escape domesticity for unfettered spurts of the sporting life, Squaw successfully managed a Jekyll-Hyde existence during the attainment of her field credentials. Frequently emerging from training sessions or hunts scratched and bleeding from greenbrier encounters, dripping with slimy garlands of algae and reeking of marsh mud, she would effect that miraculous canine transformation which left her fresh and shining by evening when she and Melanie shuffled off to bed. Our lights-out check would find them in the blissful slumber of the young, loose blond curls on a pillow of burnished obsidian.

Soon, it was Melanie's turn at schooling, and Squaw's place to mourn her daily absence. She would retreat to Melanie's room, pining away the hours and auditing the comings and goings of the household as we might watch the hands of a clock, until two-thirty each day when there would be a happy reunion. It was hard to tell who was most joyful. Both looked forward to weekends and the uninterrupted time together. Melanie began to invite schoolmates over, and it was a whimsically wonderful thing to watch four chattering, little girls and a colorful assortment of dolls and teddy bears sharing a tea setting and the latest "gossip" with a black, lady Lab decked out in Sunday hat, scarf, sweater and heels!

I would borrow her now and then for hunting sojourns. She would dance and whine at the sight of the gun. At 5 years old, Squaw was in her prime, proficient and comfortable. Waterfowl hunts would excite her, and she was a good water dog, but more than anything she loved doves. In her era, legal shooting began at high noon. It took a dog with grit to stand the sweltering September afternoons in the direct sun. Throughout her years, Squaw retained her zest for doves in the most oppressive heat, sitting alertly by my side to mark the falls. She would often gather multiple limits in an afternoon hunt, retrieving for my friends after I had shot out—all the more remarkable since we were hunting three or four days a week during the early season and the legal bag at that time was 15 birds. She was happiest when Melanie went along and would return downed birds to her rather than me, a matter of respect with a retrieving dog. When she worked for me and a group of friends, I received the honors, no matter who downed the bird. But she would not be enticed into play or be petted, by anyone. Under the gun, she was all business.

I came to understand during those times just how valuable a good retriever is. I can remember trying autumn hunts when Squaw had to search long and hard for a bird, and times when I had given up, but I cannot readily remember a time after she was two years old that she lost a dove. And that claim covers a lot of territory. A good dog is conservation in practice.

Gunning over her and watching her work was an immensely comfortable pleasure. My well-founded confidence in her retrieving

abilities allowed me to take shots I would have passed otherwise, either because of range or verdant cover. Friends liked to hunt with me because it gave them the same option. I would often take the L. C. Smith trap gun, bored full and full, and restrict myself to the highest incoming or longest crossing or quartering birds. The challenges were formidable. The first, of course, was bringing the birds to earth. The second, equally gratifying, was handling Squaw into long, blind retrieves. Birds shot at 45 or 50 yards would occasionally drift 100 yards or more before falling. It would take us awhile sometimes, but eventually we would work it out. She'd hunt and hunt and hunt far across the field, lost from eye intermittently in the heat vapors and the dust, stopping to the whistle for a new signal, then searching on. Finally, her nose would catch a wisp of scent and she would correct her line, her tail merrily quickening as she traced the wind to the find. She would return briskly, but with a measured step that said in understated pride: "Hey, look at me."

One splendid September, Squaw and I hunted doves almost every day the entire first segment, just the two of us. A series of unseasonable cold fronts marched down from the north, sweeping away the stagnant haze of summer with the delightful breath of autumn, bringing vibrant color to pallid skies. Heaven was touching earth, as it does in fall, and we made the most of it. We were hunting Sampson County that year and we located a nice flock of birds in picked corn leavings. When I glassed the field from the truck, feeding doves rose and fell like undulating waves on unsettled water! For six weeks over 10 square miles, we were able to follow those birds as they moved between cucumbers, melon, croton under cotton and corn. What a grand time we had. Squaw would sit in front of me, covering the rear. I could tell by the excitement and movement of her eyes when birds were approaching from behind, and would take them as they passed going away. I concentrated on doubles and triples and wind-driven speedsters at difficult angles. It was top-drawer shooting. I missed a lot, but we were in no hurry to fill the bag. Simply put, we were happy—free as a feelin' in the wind, to borrow a favorite line from a country tune. I think of that time each year as September rolls around. If I were to be granted a few days of my life to relive, some of those would be high on the list.

Of my friends, Jim Dean was Squaw's favorite. He smelled right, his manner was easy, and he was good for a retrieve here and there. The three of us shared some good times. There was an afternoon of wood ducks on an eastern Carolina mill pond, when early season limits were more liberal. I can sense it still, the tag end of a glorious day in early October.

The sun was dying, draining the blood-red color from the sweetgums on the aldertag point, and with it the last legal shooting hour was rapidly closing. The sky was deepening to an indigo blue, and the treeline and shoreline melted into obscurity as the shadows lengthened. I was worried.

I exchanged glances with Squaw. She was nervous and fidgety with excitement. I cautioned her and she looked mildly annoyed. Only a few minutes were left.

Then it came. Muffled in the far lower reaches of the lake, the floating, plaintive note of a lone wood duck. In the mellowing ripeness of near-dusk, it was haunting. I felt a little lonely and humble.

> "... I cannot readily remember a time after she was two years old that she lost a dove."

I caught 6 silhouettes, 4 forward, 2 trailing, over Jim's makeshift blind in the distant buckbrush. The advance guard for a virtual siege of homing woodies. The lead bird suddenly spun in a careening descent toward the water, and then the heavy thud of Jim's gun thumped the stillness. Another fell from a second wave.

Now I had my own business to attend. Two drakes and a hen rode set wings out front. I took one incoming and turned to manage one more near the range-stretching peak of its vertical ascent. As quickly as I could reload, two crossing birds climbed away, unscathed as I emptied my gun. A distant bird loomed in periphery over the treeline, and a satisfying try folded it into the top of a big sycamore. I looked to hasten Squaw in that direction but she had marked the fall and was already en route. I missed then and connected again as legal time expired.

To perfect the moment, Squaw was back. She delivered to hand a lovely drake. Once again, in yet another year, I was awed by the stunning beauty.

The shooting was over, but the occasion wasn't. I rounded up the boat, made Jim's position, and we paddled slowly toward the truck in the gathering darkness. Wings continued to cut the air with a sizzling rush, and group after group of birds fell into pockets and corners in a melee of splashes. Jim lit his pipe and settled back against a boat paddle. Squaw stretched out on the middle seat, and I turned for a moment toward the fading light of day with an unspoken word of thanks. We were hunters born again.

Squaw had become essential to a successful trip. It was far more than utility. Snuggled under a cedar blowdown in the quiet of a January snow, I felt the kinship in her eyes as we exchanged anxious glances over the ringnecks avoiding the decoys, and a special peace as the snowflakes sifted through the branches onto her dark muzzle. In the cold rain or driving sleet of a broad, windswept and desolate marsh, waiting the long hours through for a flock of geese, the comfort of her presence brought an inner satisfaction I had never known. Numb to the bone I sat, many times, watching her shiver violently in icy water, her teeth chattering in rhythm with my own. We endured it all, a matter of conjugal pride, and neither of us ever let the other down. She and I, against the worst, miserable but happily together. After Squaw, I could never again be content without a dog at my side.

All too swiftly the years passed, bringing irrevocable change as they always do. Squaw's life turned the corner from autumn to winter, and Melanie was entering adolescence. Loretta and I were solidly thirty-something. For us, time with Squaw was wonderfully mellow and Melanie was a delightful reflection in the mirror of our own passage. Yet, there was an inescapable sense of apprehension—a time, not distant, when we would lose them both. The sandbox seemed long ago, or again, just yesterday.

Dolls, tea sets, and other little girl things committed to shelf and attic, Melanie spent more and more time in "addled essence," engaging the person she was becoming. She would ride her bike relentlessly up and down our country path, or sit for hours on her favorite outcropping of rock along the pond dam, staring out over the water. She was paying less attention to Squaw now, but the Lab was undeterred. Despite her advanced age, she ran dutifully alongside the bicycle mile after mile, and sat as steadfastly by the rock at the pond as if she were a part of it. A few kind words now and then were enough.

As Melanie abandoned her childhood, much which would regain its worth in later life was laid aside, sacrificed to the evolving values of the present. Squaw would suffer with the departure, as would Loretta and I. But Melanie would come back to us one day. Ever how hard she might wish, she would not have that opportunity with Squaw. We tried to tell her that. Of course, she would not understand until much later. There

came a time when her increasing femininity demanded a nicety that relegated dog hair and the faintest suggestion of canine odor to other quarters. Squaw had slept with Melanie every night for 11 years. She had endured a succession of room guests including hamsters, lizards, rabbits, birds, turtles and a kid goat, but as surely as they came and went, she alone had been allowed to stay by Melanie's bedside. Now she could not understand or accept her exile. For weeks, she stayed at Melanie's door the long nights through, whining and scratching or despondently lying in wait. Finally, she adopted a corner in the kitchen near Melanie's room. She slept there the rest of her days. The rites of passage often inflict pain on those who do not make the journey.

I began walking to the pond afternoons after supper, encouraging Squaw to follow. I threw a few dummies for her to retrieve and it helped, at least temporarily. Gradually, she began to come around. She transferred much of her domestic stewardship to Loretta soon afterward, and followed her though daily chores as though she were appointed and accountable. Her presence, so void of intrusion it was almost a suggestion, became as comforting and essential to Loretta on the farm as it was to me on hunting outings.

Life for Squaw, in her 12th year, was gentle. After breakfast, there were stables to clean, and if the smith had been there recently, a few old pieces of hoof trimmings to chew on. At the kennels, there were balls and sticks to worry, and milk bone treats after the cleaning duties had been attended. Gardening rounds brought invigorating wallows in the cool, moist earth around the tomato plants or siestas in the pine mulch under the roses. Noontime was a pleasant stroll down the path and through the pasture for the mail. Housework was a good time for a long nap. Melanie was home at three. Supper was waiting at six. Finally, there was the evening security watch, a matter of maintaining a sort of on-call, supine alert the night through.

Even so, there remained an underlying sadness that was alleviated only in rare moments when Melanie would stop to scratch an ear or offer a few soothing words. Then some of her youthful exuberance would return and the highlights would liven her eyes again. Her affection for her best friend, tested and strained as it had been, was enduring.

In her final September, Jim Dean's son Scott and I hunted with Squaw on a Coastal Plains hog farm. It was the last episode in her lifelong affair with doves. By calendar it was autumn, but summer hung on with a death grip. Incensed by the fury of the sun, heat devils danced fiendishly over the stumps of amputated corn, and the thick air lay as offensively upon the land as heavy blankets on a warm night's bed. Dust climbed from the powdered soil with each step, suspending over the field in loitering clouds. It was dead calm, with not the suggestion of a breeze.

By the end of the day, we were soaked with sweat, sunburned, and dirty as West Virginia coal miners. And about as giddy as three dove hunters get. The shoot was grand. If I could script my perfect dove hunt, it would play out like that afternoon did with Scott Dean and Squaw amidst the heat and the dust and the hogs.

The birds came steadily, in doubles, triples, fives and tens, and at the height of the flight they circled in great gangs, rallying for another assault. We took up stands among the cedars along a fence line between the field and the hog pasture pond. You could make it as easy or as hard on yourself as you wanted; the shot selection was as varied as it comes. If you missed, you didn't have long to wait for another chance. They never quit. The field lay east-west and they came in sustained north-south patterns 'til sunset. We shot the barrels hot. Intermittently, it was nice to just stop a minute, catch your breath, and appreciate what was happening. Best of all, we had it completely to ourselves. It was Camelot on the wings of September.

"... there remained an underlying sadness that was alleviated only in rare moments when Melanie would stop to scratch an ear or offer a few soothing words."

I enjoyed that afternoon, not so much for myself, but because it was a Godsend for a hardbitten old Lab due one last day of glory and for a young boy seeing and feeling it for the first time. Squaw retrieved doves in the stifling heat and dust as only a seasoned veteran could—a bit slower, maybe, but no less sure. She retrieved until her tongue was swollen and her worn body wobbled on its underpinnings, but the fire in her eyes and the determination in her heart never waned. When the shooting was done and the sun was low, I leaned back against a fencepost for a long while and let my senses drink it all in. Squaw sat by my side as so many times before, watching the birds trade by, looking at me impatiently, waiting for the gun. Her muzzle was almost entirely white now. How I wished it could have been January snow, sifting through a cedar blowdown in the days of her prime. How fortunate I had been.

We got up and ambled down the fenceline to Scott. He was half-way on a 12-bird limit and down to five shells. He was dismayed at his shooting. Squaw and I took up his cause. I threw him a fresh box of high-brass seven and a halves and laid another out for confidence. Squaw set up station at his knee. Scott had never taken a full limit of doves before. There would never be a better time.

Scott set his jaw, then missed the next 7 birds straight. He looked back at me sheepishly. I waved it off. Squaw shifted nervously. Another miss. The day was closing and the flight had slowed. A worrying man would have had reason. Then a swift incomer caught the brunt of Scott's frustration in a shower of feathers and the timing clicked. A high, fast crossing bird flaired away, fighting for altitude, but caught the center of the pattern and crumpled into the top of a red oak. Squaw was off! An unseen pair from behind, floating in on loafing wings caught us flat-footed and hit the afterburners, twisting and diving in an acceleration spiral, pulling out to the left and right quarters, going away. Two of the toughest shots in wingshooting. Scott waited out the worst, swung past and under the left, connected hard, then swung right, missed once, and pulled again. A puff of white and the target stopped in mid-flight, collapsing into a feathered knot, and both doves were on the ground. Yes! YES! Three hulls later and Squaw had made the trip six times. The day was won. Scott raised his hand high, a wide grin on his face. I raised my own to meet his. High Fives!

A tired old Lab fetched her last limit of doves, the first for the boy. A small happening in an infinitely small corner of the globe. But in the multiplicity of such happenings across the planet lies a renewal of the human spirit and hope for the world.

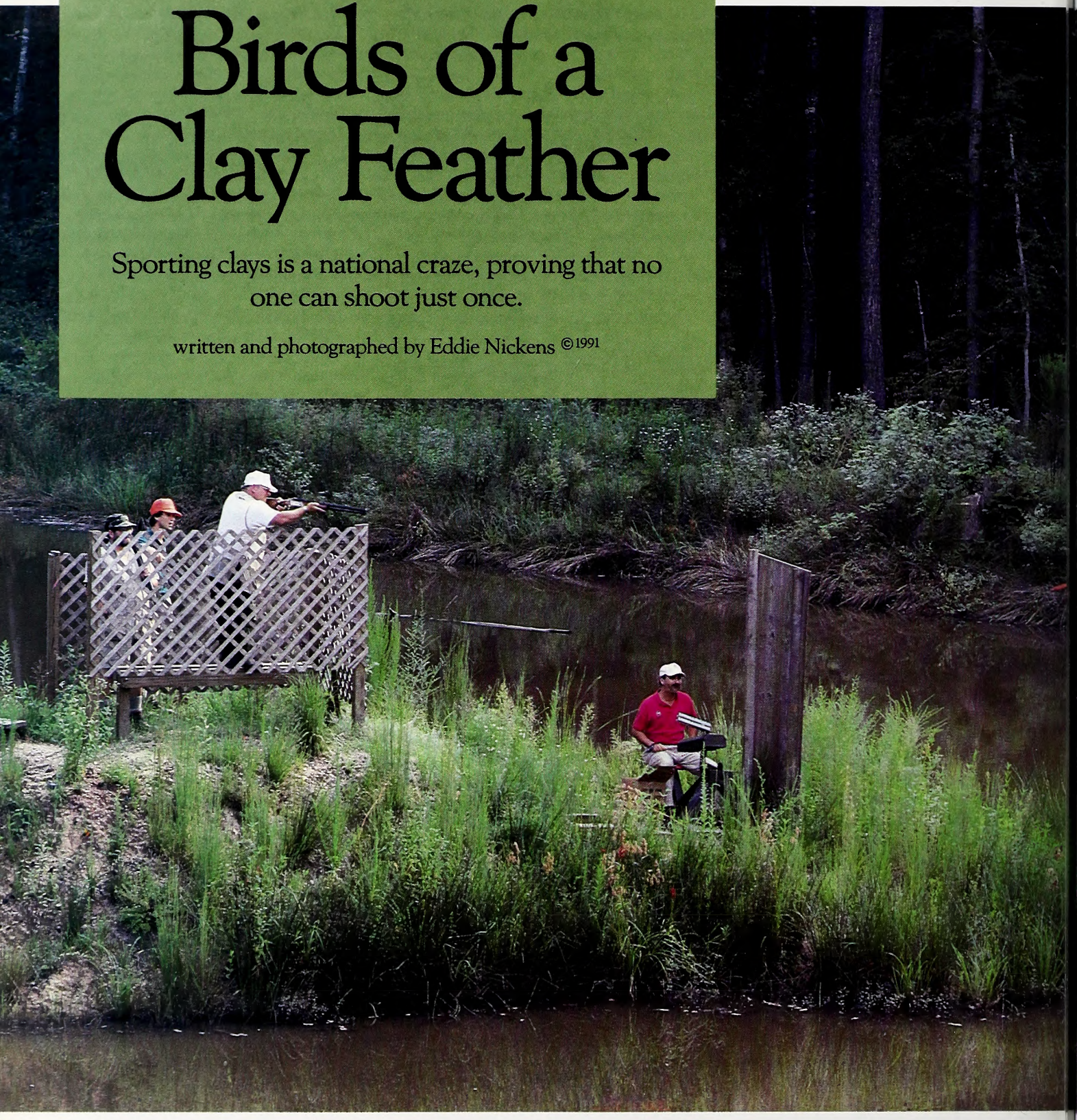
Squaw left us suddenly on a hot summer day in her 13th year. She died without imposition, as she had lived. When Loretta found her body late that afternoon, there was no sign of struggle and there had been no sound. It was as if she did not want to trouble us, even in death. We placed her passing sometime around mid-day.

Shortly after noon on the day Squaw died, Melanie received a telephone call from the Barbizon Agency. Though she would know in a few hours the deepest sadness of her young life, she had her first grown-up job. For every ending, there is a beginning. ☒

Birds of a Clay Feather

Sporting clays is a national craze, proving that no one can shoot just once.

written and photographed by Eddie Nickens ©1991



Lynn Berryman, *a nationally ranked gunner, takes aim at a pair of doubles thrown at the duck blind station at Deep River Sporting Clays near Raleigh. Unlike trap or skeet, sporting clays ranges seek to mimic real life hunting situations.*

In my defense, I am attempting what one expert gunner calls "the toughest shot in the country." A lesser man might also point out that he is a newcomer to this national craze called sporting clays, and might even protest that the pumpgun he is holding is a less-than-desirable armament for a sport in which lightning-quick reactions are a requirement. A much lesser man might even tell you that it is hot, and that the sweat is dripping into his eyes, and that, darn it, he hasn't picked up a shotgun since the end of the last duck season.

But I am not a lesser man, so I keep my mouth shut and my eyes on the trees.

"Pull!"

And here they come, from the left, a following pair of birds beating a clay-feathered retreat upward and across my sighting plane. I snug the shotgun tight into my shoulder as they wing through a small opening in the trees. Too fast. But I'm ready when, dead ahead, they reappear in a notch in this stand of second-growth pine. The big orange Ithaca bead swings past the birds and I pull the trigger and pump, pull the trigger and pump.

Through a cloud of orange dust I see the second clay bird hang in the air, capping an unseen current before falling unscathed. One for two. I turn to face the music of my peers.

"What makes this shot so difficult," says Lynn Berryman, who dubbed this station the country's toughest, "is that the whole time you're following those birds with your eyes, they're rising. But when they clear the trees, they're falling. But you don't hardly know that 'till it's all over."

Lynn catches my crestfallen look, and the National Sporting Clays Association's 14th-ranked gunner grins a big I-know-how-you-feel smile. "I'll tell you, boy," he says. "She'll get you. Ohhhh, she'll *get* you!"

She'll get you all right, whether "she" is a particularly tough shot or the addictive quality of the sport. Sporting clays was designed by the British in the 1920s partly as a result of decreasing public hunting land, and its popularity in America has only recently reached the rapid, if not rabid, rate of growth it enjoys in its homeland. There, the sport is ranked with golf as second behind fishing in participation numbers. But sporting clays American-style has altogether its own ambience. Certainly its Anglican heritage is obvious in the paraphernalia that is a customary part of even the American sporting clays range. Classic over-and-under shotguns are the arms of choice, and on some northern courses, gunners sport waxed cotton shooting jackets, tweeds and knee boots of the English riding class. But south of the Mason-Dixon line, where the sport is moving with the strength of Sherman's march, a more relaxed, if no less rabid, atmosphere prevails.

Lynn eschews the Anglican trappings of the sport for much more American digs. He shows up at the range clad in a white T-shirt and camouflage fatigues tucked into the high black paratrooper's boots. But with a Kreighoff K-80 in hand, the 1991 State Games sporting clays AA gold medalist—the highest level of competition—displays an intimate knowledge of the sport. For him, it seems, the history of sporting clays isn't as important as the present, and at the present he's on station for another deuce of neurotic pancakes due to appear on the horizon at any moment.

Underneath its genteel veneer, sporting clays is adrenalin-juiced, bottle-breaking fun. It is a field-ready version of trap and skeet, and it is nothing if not a predatory sport. Reflexes must be instant, decisions second nature. There is much of hunting's raw-nerved, moment-by-moment sense of immediacy in sporting clays, but none of the blood. Gunners stroll through a range built like a cross between a golf course and state fair shooting gallery. Each sporting clays station is designed to mimic a particular field shooting situation, and stations take advantage of local terrain and landscape to present real hunting scenarios. Gunners are faced with high passing shots like those common in dove hunting; birds that explode straight upward through heavy brush, named "springing teal"; and heavy-rimmed targets that roll and bounce along the ground like a spooked rabbit. And that's the basic premise behind sporting clays: mimic as closely as possible the conditions one might find while hunting.

At Deep River Sporting Clays between Sanford and Raleigh, the 50-bird course gives shooters ample opportunity to sample a wide range of sporting clay situations on the same course—and field test a variety of cursing techniques. The range offers 28 different gunning stations, of which perhaps 10 are used at any given time. Gunning stations are changed every week to keep regulars from "learning" the course. There is both a field and forest layout that offers a solid grounding in upland game situations and water-oriented shooting stations more closely associated with duck and goose hunting.

On the waterfowl layout, shooting stations are situated around a large pond with a central island. The shots on the pond are generally long incoming and passing angles, similar to decoying ducks and geese. Gunners shoot from the island or from stations that ring the pond, while targets

Guns & Ammo

Granted, you might *look* like you know what you're doing if you show up at the local sporting clays range with a back-bored, broadway-ribbed, port-barreled Krieghoff K-80 with radiused recoil pad and interchangeable chokes, but will you really score better for your $6,000 worth of shooting iron? Maybe—and maybe not.

Most experienced shooters say the only requirement in a serious sporting clays firearm are choke tubes. Indeed, the first perfect 100 straight sporting clays score was shot with a Remington 1100 12-gauge, as blue-collar a blunderbuss as ever was stamped from steel.

Most sporting clay gunners opt for the 12-gauge boring, with shells loaded with 2¾ dram equivalent of powder behind 1⅛ ounces of number 8 shot. That load will get through the great majority of sporting clay stations, but you might want to carry a few number 9s and 7½s for the odd-bird situation. As for chokes, an interchangeable system works best, but a gun choked skeet or improved cylinder will do the trick most of the time. Still, the best gun for you may be what you have and feel most comfortable shooting.

Other required paraphernalia should include some type of hearing and eye protection. Some sporting clay shooters carry several pairs of differently hued shooting glasses. The amber-colored lenses increase contrast when the birds are soaring across the open sky, while bluish lenses actually lighten the clay targets, making them easier to track inside the trees.

***Laurie Partlo breaks** a bouncing "rabbit" target, then swings on the flushing "quail" at the fur'n'feather station. Increasingly, hunters and non-hunting gunners of both sexes are attracted to this exciting shotgun sport.*

are thrown from the island or pitched from the pond's perimeter. One trap is elevated in a 40-foot tower, while others hurl birds from near ground level. Still, not all shots present such rational profiles. From halfway up a double-decker shooting tower gunners take a chance on blind-side overhead targets thrown from above—just like a mallard bombing in from the backside of a duck blind.

All of North Carolina's six sporting clays ranges offer similar true-to-the-woods shooting scenarios. At Adams Creek Sporting Clays in Havelock, co-owner Rusty Bryan says the sporting clays range was initially set up as a supplement to the hunting lodge and guide business. As such, it's designed to closely match hunting situations. "We use different angles, and lots of trees to keep things interesting," he says. "We do not rely on speed at all—we want the shots to be just like those you'd take in the field." One of Rusty's favorite stations is the "wood pigeon." There, clay birds flutter out of a stand of 60-foot pines, landing in an opening in the pine plantation. "The birds are slowing down, and it looks so easy," Rusty says, "but it's probably our most-missed shot."

Back at Deep River, Laurie Partlo is on deck at the Fur 'n' Feather station. She leans slightly forward, eyes intent behind amber-tinted shooting glasses, her SKB skeet model 12-gauge ready to spring to her shoulder. When she took up sporting clays only last February, Laurie's shooting skills had been honed by a mere two or three dove shoots. This summer, however, she took the gold medal in her division of the 1991 State Games sporting clays competition—and her husband Barry took a gold in the A-class competition.

"Pull!" At her command, a bouncing clay target ricochets across a field. At the gun's report the clay rabbit disintegrates in a cloud of dust, and then she's swinging her shotgun back to the left, trying to get behind the "quail" target flushed from a covert at the sound of her first shot. She fires, and the second clay target wheels into the woods, mortally wounded.

When it's my turn at bat, I powder the rabbit and miss the birds on three consecutive tries. Dismayed, I turn to Gerald Shaw, who took a silver medal in the 1991 State Games, for words of wisdom. "That bird is faster than you think," he says, grinning. "You've got to get that gun back and get some good barrel speed. You can't look back to see who's applauding when you break that rabbit." Now, how's that for realism?

Even more realistic is the difficulty of mastering sporting clays. Unlike its sister sports skeet and trap, in which hundreds of clay birds are sometimes broken without a missed shot, sporting clays tosses the gunner an unpredictable package in a variety of forms. Not only do the shooting situations differ from station to station, but the targets themselves change from round to round. The most common sporting clays target is the standard trap and skeet bird that measures 110 mm (about 4½ inches) in diameter. But a buffet of ballistically neurotic targets find its way into the throwing trap as well. In addition to the aforementioned heavily rimmed rabbit disk are size variations such as the 90-mm midi, the tiny 60-mm mini and the battue, a nearly rimless fritter known also as a "razor blade" and similar to the standard bird except that its lack of rim renders it aerodynamically psychotic. And in a never-failing quest to further handicap themselves, sporting clays fans have devised other methods of destabilizing the flight patters of targets: knock the center out of a midi, load it into the trap upside down and shoot it across water and the customized clay bird will skip like a stone on a caffeine buzz.

"Unlike trap or skeet," says Gerald, a certified sporting clays instructor, "you

can't memorize this game. In skeet, there are only 16 different targets. That's it. In sporting clays, you have to work with shotgun technique, because you never know what you're going to find in front of your gun." Or, as Deep River Sporting Clays owner Bill Kempffer explains, "You can learn how to shoot skeet, and you can learn how to shoot trap. But in this sport, you learn how to shoot a shotgun."

The variables in a sporting clay range keep it challenging even for those, like Lynne, who go through up to 200 shells a week honing skills. Range designs differ in their topography and geography, and the number of variables programmed into a particular range, says Gerald, "is limited only by the imagination and the terrain."

That's one reason sporting clays fans aren't limited to long-time hunters pacing the course and waiting for the next live bird season. Women are increasingly attracted to the sport, and gunners who have never drawn on a feathered bird are finding that the challenges of sporting clays fills a void unsatisfied by traditional skeet and trap shooting.

"One of the things I like most about this sport is that it offers people a chance to spend quality time in the outdoors," Bill says, "and some folks never have the opportunity to see what the outdoors and the shooting sports are truly like." He points to Laurie's accomplishments as proof of sporting clays' universal appeal. Ladies-only days are offered at Deep River in order for women to feel comfortable taking up what can be a completely alien type of activity. "This is such a good sport for women and children," Bill explains, "because strength has nothing to do with it. It's just determination and practice."

Determination is the only ace I'm holding as we approach the last station on today's Deep River course. I take my place at the edge of a mown field, two shells in my gun. At the target thrower's nod, I walk slowly into the field, gun at the ready. Suddenly I hear the "thoomp" of the trap, and the whirr of clay birds overhead and from behind, just like a pair of mourning doves winging into a cornfield. I twist to the right and fire twice, breaking both birds. I now have five seconds to reload a single shell for the lone bird soon to be launched overhead. "Thoomp" goes the trap just as I shuck a shell into the chamber. I shoulder and fire without hardly aiming at all, knocking not a single chip off the clay-clad bird.

"I told you before," Lynn calls from the field edge. "She'll *get* you!"

I guess he's right. This time, I have no defense. But *next* time, I tell myself, *next* time...! ☒

Close to Home Ranges

New sporting clays ranges are continually being opened, so this list may change at any time. For more information on sporting clays, contact the National Sporting Clays Association at P.O. Box 680007, San Antonio, TX 78268-0007; (800) 877-5338.

Adams Creek Gunning Lodge
Route 1, Box 119
Havelock, NC 28532
(919) 447-6808

Beaver Dam Sporting Clays
Route 4, Box 97-M
Greenville, NC 27834
(919) 758-2266

Deep River Sporting Clays
P.O. Box 18066
Raleigh, NC 27619
(919) 774-7080

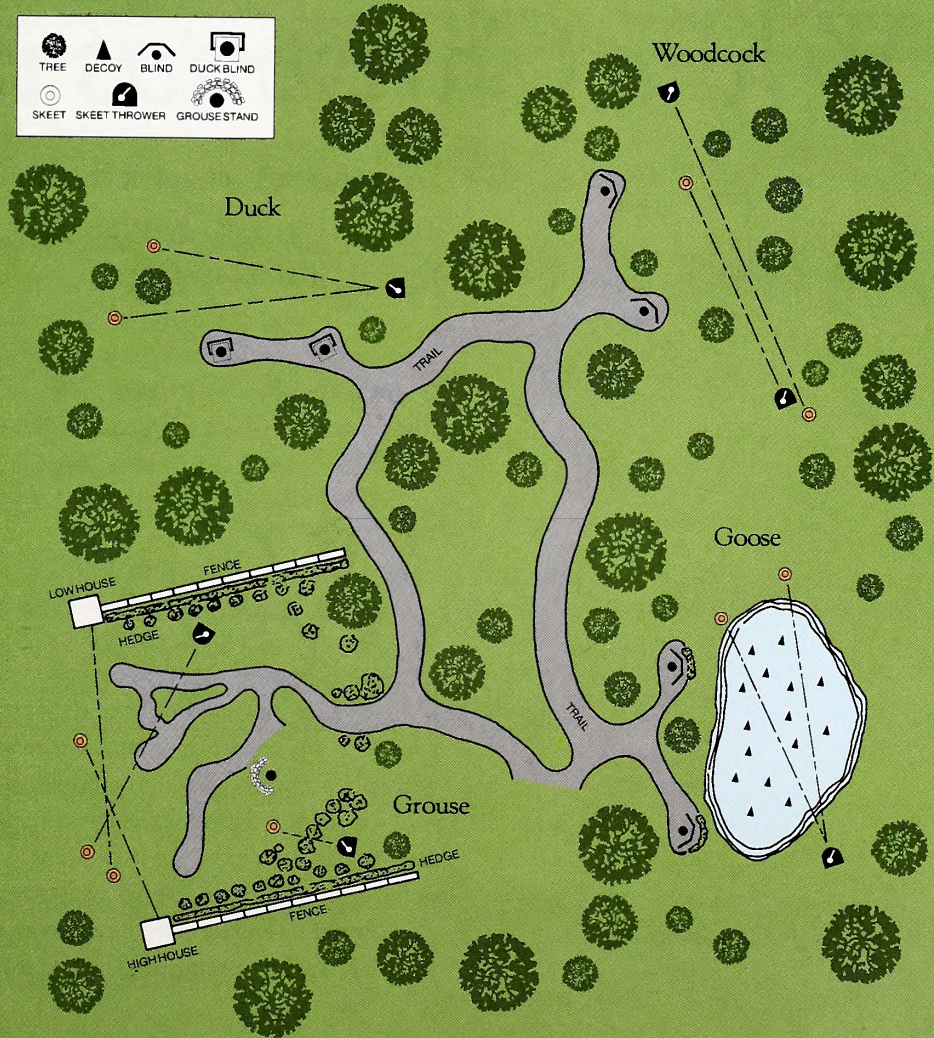
Pinehurst Gun Club
P.O. Box 4000
Pinehurst, NC 28374
(919) 295-6811

Power Pack's Ranges
1125 Highway 16 South
Denver, NC 28037
(704) 483-3528

Shane's Sporting Clays
6319-A Highway 158
Summerville, NC 27358
(919) 643-7168

Smoke Rise Field Club
P.O. Box 1069
Cashiers, NC 28717
(704) 743-5799

Sporting Clays Sampler



White Christmas in Carteret

In years yet imagined, the Christmas snow of '89 will be entered in family histories throughout the Coastal Plain, just as it was in ours.

written by Bland Simpson ©1991
illustrated by Walt Obman ©1991

We came upon the snow just outside Goldsboro at the western edge of the storm. It was not even falling there, but was forming and hanging in the air, a crystalline mist that gauzed December's stubble-fields and the dark green pines beyond. As we drove east it fell, then fell more heavily, small powdery flakes that swirled in long thin curving lines in the trailing winds of cars and trucks as they passed us—even so, it was scarcely sticking and gathering itself on the road shoulders at that time, early Saturday afternoon two days before Christmas, and not at all on the roads.

Up in the red clay hills it had been a gray morning, and no weather. But there was already a dry frosting down in Beaufort, Miss Pat, Ann's mother, had said, when she called about eight. If we were coming, we better come on.

Ann and I had sat at the diningroom table, drinking coffee, tapping the mugs and thinking: we hadn't planned to head east for another six hours. Wait that long, we figured,

and likely there'd be no Carteret County Christmas for our clan. In the coves of my heart this thought ran aground:

Her gift is already there, has been there since last night by her brother's hand. My plan, and his cheerful collaboration in theatrical holiday surprise.

Grandparents' tales of Albemarle Sound frozen over and the mailtruck driving shortcut across the ice filled my head, sleighbells rang, and we moved out—grabbed Hunter and Susannah, our four-year-old twins, hurriedly tarped over the unassembled bicycles in the back of our big white woody station wagon, and roared off into the Coastal Plain. We would drive as far east as we safely could, stop and stay in a motel if we had to, then see what it was like Christmas Eve. We made Kinston, gassed up at the Neuse Sport Shop, that great eastern tacklebox, glided easily down the four-lane where in warmer times we see deer browsing at the reaching edges of swamps, and passed New Bern.

At Havelock things changed abruptly.

Havelock Creek was the border—over the bridge the snow was thick on the road. I cannot imagine what shift of nature was occurring in the great pinelands of the Croatan Forest, but shift it did, and we had to figure again. If we stayed on Route 70, even if the Newport Bridge from Morehead to Beaufort were open now, that high vaulting span could easily be closed due to snow and wind during the hour or two it would take to get that far. The sure and safe road to Beaufort would be 101, the back way, the flat way where only Core Creek Bridge over the Inland Waterway presented any elevation.

So just before dark we pulled in at the house on Orange Street, and the twins were ecstatic. The wind had grown steadily as we moved east, and the powder was gathering quickly in big drifts. They had been in snow that deep, but not since they could remember. Now they wanted it all, to dive into it, roll in it, swim in it, eat it, throw it (though it was far too dry to clump a snowball at all). After dinner Ann's sister and aunt took them on a promenade, and when they returned, the twins' faces were bright red, burnished by the cold, and they couldn't say enough good about it:

"It's wonderful out there!" they went on and on. "Just wonderful!"

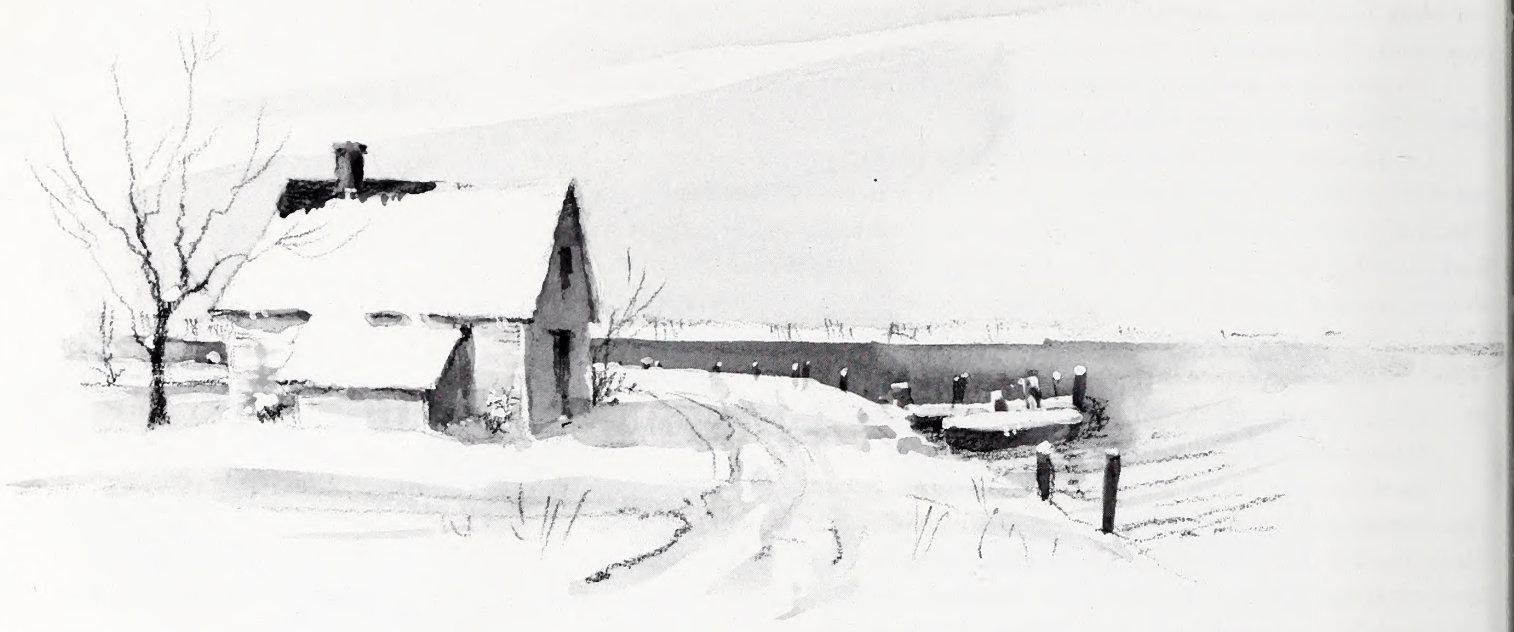
"I want to stay here forever!" Susannah shouted next morning from her cedar tree perch 3 feet above the snow.

It was Christmas Eve, and we were out surveying the cold gray harbor of blizzard-bound Beaufort. The snow was over the doorhandles of the stationwagon, and the children in their snowsuits shrieked gleefully, "Throw me in, throw me!" There was not a tire track on Orange Street, and just after we got the little redhead down out of the tree, we all spied the most effective traffic of the day, cousin Sue gliding down Front Street on crosscountry skis, alternately pushing with her poles and waving at us as she approached, passing an 8-foot drift at Clawsen's lamp post.

They were skiing crosscountry down in Wilmington just then, too, though other news from around the East was less sporty. There was gale force wind all up and down what Rachel Carson called "the sound country," and Nature dropped three cottages into the winter seas of Kitty Hawk. Power was out in Pender, and hundreds lost heat, light and water in this first-ever Outer Banks white Christmas—a Coast Guardsman called it "Your basic Siberia effect."

By Christmas morning there would be 4 inches of snow in Robeson County, 5 inches in Fayetteville, 15 inches and zero degrees in Wilmington, where fish and a pelican were reported dead. Twenty-five miles north of Kitty Hawk a 600-foot Navy tanker ran aground. There was nearly as much snow in Myrtle Beach and Charleston, and the same cold in Florida was killing the citrus and sugarcane and strawberries.

But all that was far away from Hunter, who had unshakeable faith that Santa Claus



would find him wherever he was. He dropped off easily on the eve of the big day, but his twin sister worried over this very point and stayed awake, which worried her even more. (I have to admit I fretted some too, over Ann's present that was still 30 miles farther east, down at Sea Level on Core Sound.) When Susannah finally fell asleep around two, we helped Santa wheel the pair of little bicycles—one black, one pink, that we had helped him put together above the garage out back—into the house and under the tree.

Then it was our turn to embrace and regard the Christmas we had been given, to rejoice that our holiday found us happy with family and friends in the land of poached fish and oyster dressing, in a realm where some still remember such tideland traditions as Christmas Eve flounder gigging:

"Next day," said Wilmington's *Star-News* that snowbound Sunday in '89, "the unfortunate flounders, lovingly stuffed with native delicacies such as oysters, crabs, collards and grits, graced Christmas tables all over the area. Non-Baptists who could afford it and knew a reliable bootlegger accompanied the humble dish with a jelly glass of high octane cheer."

Boats were frozen atilt, masts askew, in the rimy ice of Taylors Creek, in North River too (where brother Tad had nearly been blown off the bridge with Ann's present three nights earlier) on our way Down East in Carteret. The tawny marshes were vast plains of snow, and the duckblinds and small shacks that dot them were lifeless, lonesome in the long, slanting western sunlight. So different was the look of the place now that Ann and sister Carolyn, both of whom grew up here, frequently had difficulty figuring right where we were as we crawled towards Sea Level and their father's home along US 70. "This is where Ann saw the bear," we said, just past the Harkers Island turn-off. No bruins abroad today, but near Williston, home of the world's first scallop-shelling machine, we did catch a glimpse of a goose huddling and shivering in an icy ditch beside the road.

At Doctor John's the fire was all ablaze, as Ann says it always will be on Christmas, even if it is balmy and all the windows have to be thrown open. The fire was no decoration this 20-degree holiday, and the only thing thrown open was our collective spirit. We warmed ourselves at that hearth, took turns, very much for real, and Tad took me aside and told me of the remarkable voyage down.

"Nearly lost that thing on North River bridge," he said, laughing but with a serious turn of the head that said *It's funny NOW but it sure wasn't when it happened.* "Only had it tied front and back, not over the top—it started to go sideways. I mean it was a *gale*! Had to get out and re-tie it *on the bridge, in the dark, with ALL THAT WIND*!"

There was no way to tell him how grateful I was, how sorry I was, too, for the trouble it had turned out to be, and the danger. The plan had seemed innocent enough when he and I had hatched it over Thanksgiving, but no design is immutable; neither of us could have foreseen the darker possibilities the winter storm unleashed and flung at him.

Men happy of heart do not light long at such places. Together Tad and I acknowledged his trial, but did not let our spirits darken. The livingroom was full—Doctor John is the only physician east of North River, and has many friends. Outside, beyond the snowdrifted deck, the waters of the cove off Core sound where fishingboats take shelter lay settled in the cold blue evening light.

It would be dark in twenty minutes. Now was the time. After a brief, whispered instruction to Hunter, I slipped outside with the jovial, brawny fisherman Duke, and together we took the present in hand, all 17 feet of it, brushed the snow off it and carried it from beneath the live oak tree around back, where in a moment we would come into view of all those on the warm side of the living room's wall of glass.

I stopped, peered in, saw Hunter standing still behind Ann, he not moving till he saw me, then reaching around the corner and retrieving the ash paddle and putting it in her hands and pointing our way, just as Duke and I slid the long, gleaming white canoe up onto the snowy deck, Ann's expression one of thorough surprise and unequivocal delight as she smiled at me and looked around at all of us and over and over again at the graceful flatwater craft come to rest in the drift of powder at her childhood home.

A week later we were watching six eagles soar over Gulfcoast Florida, and plying the limestone shallows of the Waccasassa River and the sand-dollared tidal flats at Cedar Key, all in 70-degree weather. Carteret County seemed a dream. And so it was, fulfilled by the accretion of moments, by Tad's labors, by all the loving encouragements of kin. Those moments were magic, and we relive them often in our hearts, where a towhead boy will always be half the height of a boat-paddle and a snowy redhead girl will sit in a Beaufort cedar tree forever! and a Down East man and woman will float the sound country ever after in a canoe as white as the driven Christmas snow. ⊠

More Hunters Will Take Part

New Migratory Gamebird Harvest Permit Under Way

Written and Edited by Vic Venters

JACK DERMID

Rail Research: *The clapper rail, shown here with her young, is one of the migratory gamebirds for which the U.S. Fish and Wildlife Service lacks reliable harvest data. By 1998, a new migratory gamebird permit program should provide needed information for all migratory gamebird species. Better harvest data are needed to manage gamebird populations in the face of shrinking habitat and increasing challenges to hunting from anti-hunting groups.*

The U.S. Fish and Wildlife Service and state wildlife agencies have launched the first phase of a new program to obtain better hunter harvest data on waterfowl, woodcock, doves and other migratory game birds. The new program is being implemented in five states in 1992 and will include all migratory game bird hunters in the nation by 1998.

The new program, titled the Migratory Bird Harvest Information Program, will be similar to the voluntary waterfowl harvest surveys that have been conducted for many years. Under the expanded program, all migratory bird hunters will fill out a short name and address form. The Fish and Wildlife Service will use the names to contact a statistically valid sample of hunters to provide information about their annual hunting success.

The program is needed because the current migratory gamebird survey, based on a voluntary response from Duck Stamp purchasers, has been troubled by poor response from hunters and improper distribution by the U.S. Postal Service, say U.S. Fish and Wildlife Service officials.

"Right now, we're only sampling about 8 percent of the waterfowl hunters," said Tom Dwyer, Chief of the Fish and Wildlife Service's Office of Migratory Bird Management. "That poses a number of problems. What if the kill data from the 8 percent we survey are completely different from the other 92 percent of the hunters in the numbers of birds that are killed? Our kill estimates could have a very serious bias. Whenever you are dealing with voluntary survey results, you can have this problem."

The current program is also flawed and incomplete because it principally surveys waterfowl hunters, not necessarily those who concentrate on hunting species like woodcock, dove, rails and snipe. This lack of reliable harvest data is of special concern for many biologists studying woodcock, a game bird whose population has crashed in the last 20 years. Harvest data for snipe and rails are also virtually nonexistent.

Accurate harvest data are important because it can be used to track populations of migratory birds in some instances. It also gives wildlife managers the information necessary to adjust regulations and bag limits so that species are not overharvested. "Accurate harvest estimates could become important to help withstand increasing legal challenges," said Phil Million, chief of public affairs for the Fish and Wildlife Service in reference to increasing lawsuits directed against wildlife agencies by anti-hunting groups.

"Reliable harvest data on webless migratory gamebirds such as woodcock, doves and rails simply do not exist," states the Wildlife Management Institute. "As habitats for these animals shrink and hunting demand continues, managers must have better management information to protect the populations and justify hunting them. Agencies must have data that will stand up in court."

Details of how the program will work in individual states are still being worked out, although efforts are being made to keep it low-cost and user-friendly. As planned, the Fish and Wildlife Service will distribute the harvest information forms free to states, who may charge a small fee to cover their administrative costs.

The expansion of the national harvest survey was again recommended in 1990 by the International Association of Fish and Wildlife Agencies, an association of state, federal and Canadian wildlife agencies. So far, five states—California, Minnesota, Missouri, Pennsylvania and South Dakota—have volunteered to participate first.

Rare Raptors Soar Again in Smokies

Biologist Awarded for Peregrine Falcon Restoration

In 1957, the last breeding site for peregrine falcons disappeared from the mountains of western North Carolina. Within a few more years, the peregrine falcon had been extirpated from all of eastern North America. Although adequate habitat still existed, the bird had fallen victim to DDT and other pesticide poisoning in the food chain.

Fortunately, peregrine falcons have returned to the mountains of North Carolina, thanks to the banning of DDT, a national recovery plan and the hard work of the biologists who made the complex restoration possible.

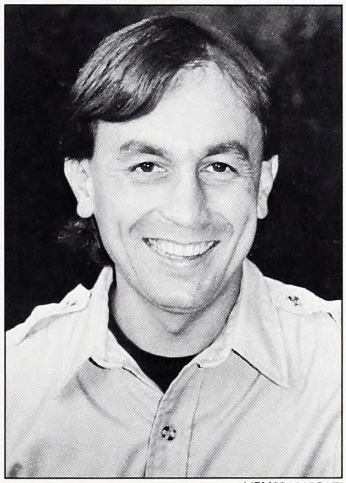
In North Carolina, those lucky enough to catch a glimpse of the elusive raptor owe many thanks to Allen Boynton, biologist and peregrine falcon team leader for the Wildlife Commission's Nongame and Endangered Species Program.

For his work, Boynton was recently awarded the prestigious Wildlife Management Excellence Award by the Southeastern section of The Wildlife Society. The Wildlife Society is a professional society of biologists dedicated to the scientific management of wildlife.

"The North Carolina breeding population of peregrine falcons increased from zero to eight breeding pairs in the period from 1984 to 1990 in large part because of the hard work and outstanding skills of this dedicated biologist," explained Jack Donnelly, coordinator for the Nongame and Endangered Species Program. "It is even more laudable when one realizes the peregrine project was only one of the several projects Allen was responsible for during this same period."

"I'm thrilled to receive the award, especially since it's a professional award from biologists," said Boynton. "I'd also like to thank my wife Ellen and our children. I couldn't have done this without their support."

Restoring the peregrine falcon to North Carolina has been no easy task and has required a mixture of brains and brawn. Peregrine restoration plans began in earnest in 1981. A complex coordination schedule was formulated for shipping live birds to North Carolina.



MELISSA MCGAW

Biologist Awarded: *Allen Boynton, a Wildlife Commission nongame biologist, was recently awarded a Wildlife Management Excellence Award from the Wildlife Society, a professional organization of biologists. Boyton garnered the award for leading peregrine falcon restoration efforts in North Carolina.*

Hacking sites, where the birds were to be released, were identified and monitored for the presence of great horned owls, a major predator of peregrine falcons. In 1984, peregrines were released again into the wild.

Since most of the quality peregrine habitat is located on National Forest land in the southern Appalachians, it has been one of Boynton's key responsibilities to coordinate all the peregrine restoration work with U.S. Forest Service personnel.

To date, Allen has also trained 204 volunteers who have spent 2,500 hours watching the progress of these nesting birds. To keep these volunteers informed, Allen has also prepared and edited *North Carolina Peregrine Falcon News*, a newsletter published twice a year in February and September.

Because peregrines nest on vertical rock faces many hundreds of feet above ground, Boynton has been forced to conduct many nest surveys by treacherous low-level helicopter flights. On his own initiative, Boynton also began rock climbing and is now able to climb all but the most difficult cliff faces.

"This was a volunteer task on his part and was never expected of our project leaders," Jack Donnelly said. "By honing this rock climbing skill, Allen has been able to collect prey remains, egg shell fragments and dead chicks to help monitor the potential occurrence of pesticides in the peregrines. In addition, we have been able to place a young bird at a failed nest and get the adults to raise this fostered bird to flight age." These rock climbing skills have also enabled him to climb into bat caves to assess wintering populations.

The hard work has paid off. During 1989, for example, 73 volunteers were recruited to watch 17 cliffs. This intensive coordinated effort located eight pairs of peregrines on territory, four of which made breeding attempts resulting in at least 10 young being produced.

Field Notes

Eastern Gun Deer	Through Jan. 1	Ruffed Grouse	Through Feb. 29
Central Gun Deer	Through Jan. 1	Snipe	Through Feb. 28
Northwestern Gun Deer	Through Dec. 7	Woodcock	Opens Dec. 5
Western Gun Deer	Through Dec. 14	Mourning Dove (winter season)	Opens Dec. 13
Black Bear	See *Regulations Digest*	Crow	See *Regulations Digest*
Wild Boar	See *Regulations Digest*	Ducks, Mergansers and Coots	Opens Dec. 12
Gray Squirrel	Through Jan. 31	Sea Ducks	Through Jan. 15
Fox Squirrel	See *Regulations Digest*	Snow and Blue Geese	Through Feb. 10
Rabbit	Through Feb. 29	Swan (permit only)	Through Jan. 31
Raccoon and Opossum	See *Regulations Digest*		
Brant	Opens Dec. 12		
Bobwhite Quail	Through Feb. 29		

Information on bag limits, either-sex hunts and other regulations may be found in the *1991-92 North Carolina Inland Fishing, Hunting & Trapping Regulations Digest*. For a copy, check with license agents or contact the N.C. Wildlife Resources Commission, 512 N. Salisbury St., Raleigh, N.C. 27604-1188.

Shop Class Helps Waterfowl

Students Build 10,000th Duck Box

MELISSA MCGAW

Homes for Wood Ducks: *Western Alamance High School teacher J.W. Busick (right) presents the 10,000th wood duck box made by his students to Charles R. Fullwood, executive director of the N.C. Wildlife Resources Commission.*

Over the past 17 years, more than 1,200 Western Alamance High School students have made 10,000 homes for wood ducks in North and South Carolina.

Since 1974, vocational agriculture teacher J.W. Busick has taught students in his classes to build wood duck boxes. The nesting boxes, which sell for $12.50 per box, have been placed at beaver ponds and other bodies of water across North Carolina. The boxes have been purchased by organizations such as wildlife clubs for placement in North Carolina and elsewhere. For instance, the South Carolina Waterfowl Association bought 5,000 boxes from Busick's classes to place in South Carolina.

Busick got the wood duck box idea when the Resource Conservation and Development Committee began looking for wildlife projects to sponsor. The committee, of which Busick is now president, is affiliated with the Soil Conservation Service and serves seven counties.

The first year Busick's students made wood duck boxes, they produced 75. Now they make 400 boxes in four weeks.

They made four wood duck boxes to commemorate the 10,000th completed box. Box number 10,000-A will remain at Western Alamance High School six miles north of Burlington. The box numbered 10,000-B will go to the Resource Conservation and Development Wildlife Committee, while Box 10,000-C will go to the N.C. Wildlife Federation, and 10,000-D will go to the N.C. Wildlife Resources Commission. Both the N.C. Wildlife Resources Commission and the Wildlife Federation have sponsored the wood duck project.

— Angela Dorman Hill

Walker's Painting Popular

Artist Helps Red Wolf Recovery

By purchasing a print of Janet Allen Walker's painting, "Return to the Wild—Red Wolves," you can help restore the endangered red wolf to its rightful place in nature. In 1989, the North Carolina artist committed to assisting the recovery program by donating profits from the sale of prints of her red wolf painting. Walker's painting has been extremely popular and is featured in this year's *North Carolina Wildlife Calendar* produced by the Wildlife Resources Commission. (For a color reproduction of the print, see the inside back cover of the September issue of *Wildlife in North Carolina*).

Today, the Alligator River National Wildlife Refuge in northeastern North Carolina is home to the largest self-sustaining population of red wolves in the wild. Red wolves were reintroduced to the federal refuge in 1987 as part of the U.S. Fish and Wildlife Service's red wolf recovery plan.

The reintroduction has progressed well. Since October 1987, 29 captive-born wolves have been released and about 15 wolves have been born in the wild. It is significant that every year adult pairs have been together in the wild during the breeding season, pups have been born the following spring. The reintroduction is proving that captive-born wolves can adjust to life in the wild and successfully reproduce in eastern North Carolina. Currently, the free-ranging population is about 24 animals. Approximately half that number were born in the wild.

You can help the red wolf recovery plan by purchasing a print. Regular prints are priced at $85, artists proofs are $100 and remarques are $185. Shipping costs are $5 and state taxes are 6 percent of the print's price. Prints can be ordered from the Red Wolf Program, Alligator River National Wildlife Refuge, P.O. Box 1969, Manteo, NC 27954, or call (919) 473-1131.

NC WILDLIFE RESOURCES COMMISSION

Proceeds From Prints: *North Carolina artist Janet Allen Walker is donating 50 percent of her profits from the sale of the print "Return to the Wild—Red Wolves" to red wolf recovery efforts. This money will be matched through a challenge grant administered by the National Fish and Wildlife Foundation.*

Calendar

On several occasions, events in this calendar have been changed without notice. Readers should check with the contact listed before traveling to an event. Listings for the calendar should be sent in at least four months in advance.

Dec. 6-8

The 23rd Annual North Carolina Wildlife Art Exhibition will be held at the N.C. State Fairgrounds in Raleigh. The show will feature wildlife paintings, drawings, prints, sculpture, woodcarvings and photography from nationally known and local artists. Also featured will be the Young People's Art Exhibition with a display and competition from local school students. For more information, contact Amy Miller, N.C. Wildlife Federation, P.O. Box 10626, Raleigh, N.C. 27605, or call (919) 833-1192.

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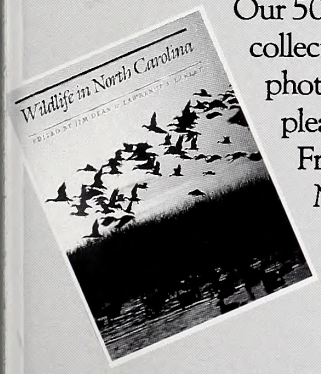

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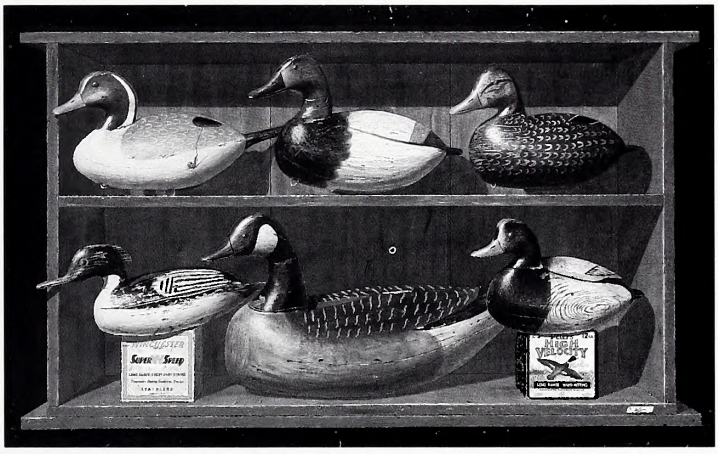

***With such artwork** as Joe Seme's "Hudsons" featured above, the North Carolina Wildlife Calendar is sure to sell out again this year. All calendar art is in color.*

The works of Robert C. Flowers, Jr., Janet Allen Walker, David E. Doss, Patsy McAuley, Bob Henley, Bob Herr, Duane Raver, Larry Barton, Walt Obman, James A. Brooks, Joe Seme, and Bob Timberlake are featured in the 1992 Wildlife Calendar. Order yours today by returning the form below with your check or money order to 1992 Calendar, N.C. Wildlife Resources Commission, 512 N. Salisbury Street, Raleigh, NC 27604-1188.

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CALO92

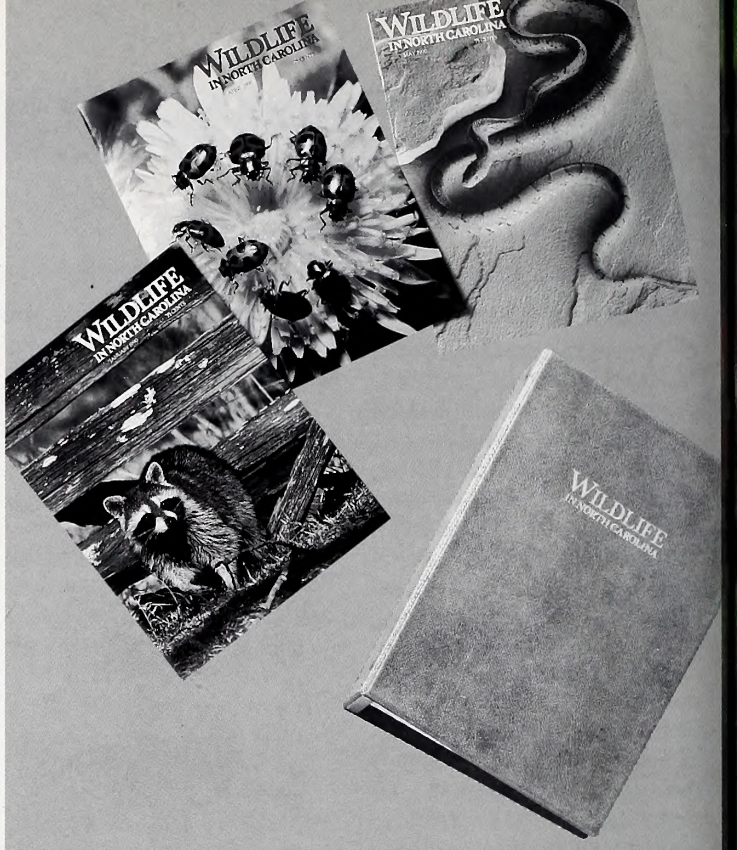
Draining Ponds, Breaking Ice, Claiming Fields

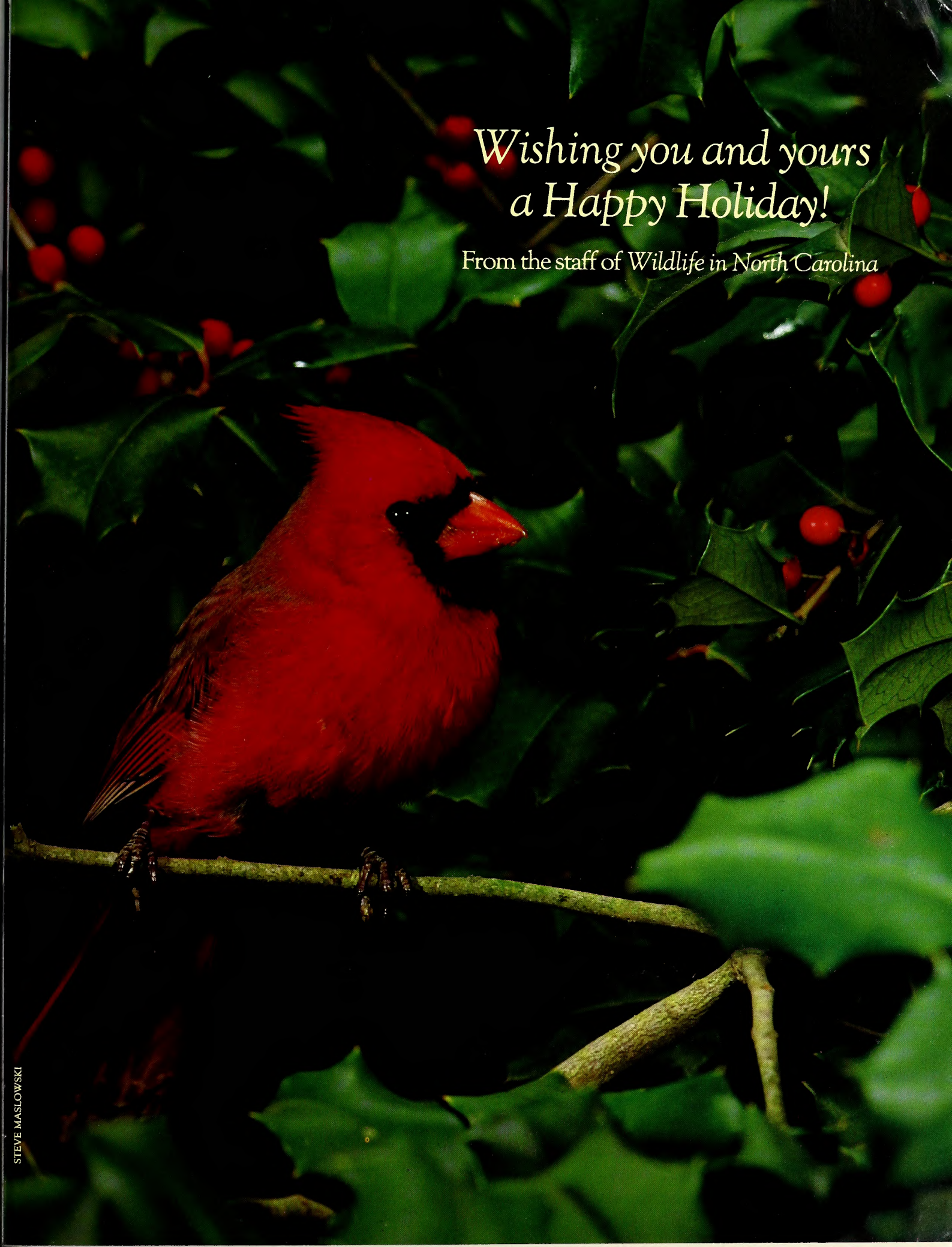
by Vic Venters

Down the Drain: December is an excellent month to draw water levels down in your farm pond to kill off unwanted vegetation beds. When aquatic vegetation becomes too dense in a small pond, sunfish can become overcrowded and stunted because of the excessive cover provided by the vegetation. Reducing the surface area of the pond by one third to one half in the winter helps control many noxious aquatic weeds by exposing their tubers and roots to drying and freezing. In a typical pond, this might mean drawing water levels down about four feet. If your pond is very shallow, be careful that you leave enough depth so that fish do not freeze in the winter. Also, winter draw down is not recommended in ponds less than one acre. Unfortunately, some species such as hydrilla are not killed or controlled by winter draw down because the weeds produce tubers capable of surviving the draw down. Winter draw down can also alter the predator/prey balance in the pond by concentrating the smaller fish so that the larger bass can eat them. This can be good strategy when you are seeking larger sizes of bream or bass to catch. This strategy works best when the pond is not too crowded with stunted sunfish. Winter draw downs can be conducted from about mid-November up to the beginning of March. For more information or technical assistance, contact the Wildlife Commission's Division of Inland Fisheries at (919) 733-3633.

Water Worries: Your dog or cat is not the only animal that needs drinkable water when cold weather freezes its watering trough. If you've got a bird bath or bird watering area in your yard, don't forget to break or melt the ice when it freezes. Birds and small mammals that use the water you provide come to depend on you for continuing the supply. Keep the feeders full, too.

Reclaiming Fields: A warm day in the winter is a good time to reclaim old fields that have grown up. Use a chain saw or bush axe to thin out saplings and young pines. You'll be able to do more effective work now, before the spring foliage begins to bloom.

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a Happy Holiday!
From the staff of Wildlife in North Carolina
STEVE MASLOWSKI

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